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VIEWS, NEWS AND INTERVIEWS.

Mr. C. O. Baker, Jr., the well-known platinum refiner of Newark, N. J., sailed for Europe on the "Majestic," Wednesday of last week, and had for fellow voyagers one of the most heterogeneous crowds imaginable. Here is a partial list: The dead were represented by "Squire" Abington, the great English sporting man who died recently in New Orleans; the financial world was present in Mr. J. Pierpont Morgan; pugilism contributed Charley Mitchell and Jim Hall; Princess Kaiulani, returning to England after a fruitless quest for a throne, may represent royalty; the variety stage loaned for the occasion Vesta Victoria, who has danced the dollars out at Pastor's Theatre; Albert Bial, of Koster & Bial's concert hall, was aboard; and filling in as a background to set off this firmament of stars were politicians, lawyers, clergymen and laymen in numbers. Mr. Baker is thus afforded an unusual opportunity to add to his stock of varied knowledge, and he can celebrate the occasion on his return to New Jersey by utilizing his great silver punch bowl, which he was, unfortunately, obliged to leave at home.

The Direct United States Cable Company on March 23 signaled the result of the Oxford-Cambridge boat race to the United Press within 18 seconds of the finish. The race was ended at four o'clock 51 minutes 47 seconds P. M., Greenwich time, and the result was announced to the United Press in New York, over the Direct Cable at 4.52 P. M., Greenwich time—less than a quarter of a minute being consumed in obtaining the news at the course, forwarding it through London and across the Atlantic, and signaling it to the New York office of the United Press.

In compliance with a resolution of the Senate, the United States Consuls have been directed by the State Department to prepare reports on the use of electricity as a power in the propulsion of farm machinery and implements and in the propagation of plants in their respective districts. The papers received in pursuance to these instructions are going through the press and will soon be issued by the department. They show that at only a few places have even experiments in these directions been made.

An experiment that proved eminently successful was that made at the 33-inch mill of the Homestead Steel Works last week, when the immense tables were operated by electricity.

Although the advantages of the electric light are becoming very generally recognized, there are many persons who are still unconvinced of its superiority as an illuminant and of its cheapness as compared with gas. Commenting on some of the adverse criticism which has been vented on the modern light, a writer calls to mind the fact that Clement Desormes, writing in 1819 about coal gas, then just coming into use, says: "The light is of a disagreeable yellow color, entirely different from the red and warm gleam of oil lamps; it is of dazzling brightness; its distribution will be impossible and irregular, and it will be much dearer than oil lighting, and even if it should be improved it will remain much dearer than these lights which we already possess." The same or very similar criticisms are now being made on the electric light. But it is no use. The survival of the fittest is a recognized truth.

THE TELEGRAPH OFFICE IN THE EXECUTIVE MANSION, WASHINGTON, D. C.

A few years ago an individual in cultured Boston was prosecuted for stealing a million feet of gas, and now an absent-minded Russian in St. Petersburg has been found guilty of appropriating a few thousand amperes of electricity. He drilled a hole through a wall, tapped a line wire which ran to a neighboring plant, and used enough electricity to run his entire factory. Whether he will be sent to Siberia, or be complimented on his skill in getting the best of a Russian electric light company, remains to be seen.

At the last annual dinner of the National Capital Press Club, given in the banquet room of the Arlington Hotel, Washington, on March 18, a special feature of the affair was the stretching of a telegraph wire on poles around the tables and the sending of fictitious and humorous messages from several centers, the recipients of which were expected to make replies. Among the guests were Vice-President Stevenson, Speaker Crisp, the late Elliott F. Shepard, Secretary Herbert, Secretary Smith and Postmaster-General Bissell.

Last week the Kaiser had a narrow escape during a thunder-storm and the reports state that none of the German papers dared report the fact. It appears that while he was talking to the central office, to call up Caprivi, the wire suddenly ceased to work. The Kaiser immediately desired an investigation and sent Moltke to make inquiries at the central office. Whenever the Kaiser desires to speak through the telephone, every one in the central office must stop work, and leave the room to the sole possession of one special operator and a stenographer. He does not use the vulgar word Hello! but simply commences his message with the kingly expression, "Ich commandire" (I command). The Kaiser had no sooner delivered this fiat than a bold bolt of lightning danced along the wire, and, for some reason unknown at the present time, selected the poor operator and stenographer, instead of his majesty, and knocked them senseless. When Moltke arrived he learned the circumstances, and now the Emperor's own physician is attending to the patients, who are suffering from spinal shock and extreme nervous prostration.

The U. S. Government Departmental Telegraph Service.

THE WHITE HOUSE OPERATOR AND HIS DUTIES—THE ABLE OPERATORS WHO CONDUCT OUR GOVERNMENT'S ROUTINE AND SECRET BUSINESS — WOMAN'S IMPORTANT PLACE IN THE SERVICE—TELEGRAPHIC ANECDOTES.

BY GEORGE C. MAYNARD.

President Harrison has retired from his place at the head of the government, the cabinet officers have returned to their private stations in life, secretaries and aides have been dismissed, a new chief executive has been inaugurated, but the members of the government's electrical cabinet hold their places and are keeping the machinery of government running.

For 15 years Mr. Benjamin F. Montgomery has held the nominal position of telegraph operator at the White House, and has served under the administrations of both political parties with equal success and satisfaction. The position is a very important one, its duties being quite different from those of an operator who is simply required to send and receive messages.

The system of departmental telegraph lines connects the Executive Mansion with the Capitol and all the executive departments, while wires of the Western Union and Postal Telegraph Companies and the press associations put the government in touch with the rest of creation. Besides these, numerous private and public telephone lines center in the President's office. The telegraph is used for business of a confidential nature, and for such as requires the keeping of a permanent record. For the receipt of telegrams of this character the typewriter is used, in the operation of which Montgomery is expert. Besides that which goes to form a permanent record, a great volume of business is constantly passing, not by "word of mouth," nor by telephonic shouting, which is sure to be heard by the bystanders, whatever the person at the other end of the wire may receive, but by the "little tick" which even the most enterprising newspaper reporters fail to comprehend. If the President wishes to hold a special meeting of his cabinet or to see one of his secretaries, if he wants any information concerning business before Congress or in the departments, he simply mentions his desire to the operator, who instantly passes the word to any or all of his ten associates, and the person or the information wanted is forthcoming.

If the leading Cabinet officer wishes to have a private interview with the President on important affairs of the State, he does not write a formal official communication to "His Excellency" asking him to fix a time when he can call, and set all the curious watchers to guessing the errand of a hurry-

ing messenger, but the telegraph arranges the business in a moment.

The same custom prevails, to a considerable extent, with matters outside of the city, through the courtesy of telegraph companies and press associations which freely give the use of their lines for the purpose. The arrival of a vessel off Sandy Hook or the Golden Gate, a panic in Wall street, the dangers of flood, fire or pestilence in any part of the country, anything of special interest to the government or anything calling for its intervention, is quickly made known to the President. It is not an uncommon thing for him to sit beside the operator for hours at a time receiving reports, giving verbal instructions, or sending formal despatches, as the occasion may require. The Johnstown flood, the Homestead strikes, the cholera quarantine, found him with his hand on the electrical pulse of the country. In addition to business of this character, the operator has continually to answer questions from all conditions of persons and on every conceivable subject, from the most important and appropriate to the most supremely impudent. "Is the President in?" "Has he finished his breakfast?" "Can I see him right away?" "Has he made my appointment?" "Do the ladies receive to day?" "What style of dress should my wife wear?" "How is the baby's measles?" are specimen questions which must be answered promptly and with graceful tact, which gives the questioner to understand that he is the President's best friend.

In addition to all this, it is the White House operator's special duty to go over about a thousand newspapers every day, to discard all the fiction and condense all the facts they contain. What he saves goes into a series of moderate sized scrap books, properly labeled by subjects for the President's reference; what he throws aside would furnish half the kitchen fires in the District of Columbia with kindling.

Montgomery is a Virginian. When Gen. Grant had his heavy artillery trained on Petersburg, Benjamin stood on the roof of his grandmother's woodshed and dodged the shells. Shortly after the close of the war he began the telegraph business as a messenger, worked for the Western Union Company for several years, and then entered the Signal Service, from which he was chosen for his present position.

The departmental telegraph was established in 1873. The act of Congress appropriating money for its construction contained a provision that the wires leading into the Capitol Building should be laid underground, and that was the beginning of subterranean line work in Washington. The builders of the lines were quite unconscious of the difficult problem they had encountered and innocently procured a gutta percha cable with a tarred hemp covering from the Bishop Gutta Percha Company, of New York, and laid it in the ground, where it has continued to work satisfactorily through many epochs of subway development.

It now seems incredible that, during the whole period of the war, when so much important business was constantly being done by telegraph, the President, who was also the Commander-in-Chief of the Army and Navy, should have no wires connecting with his office, but such is the fact. The central telegraph office of the government was then in the War Department, and the President was a frequent visitor there. One of the most striking and pathetic silhouettes on the pages of the history of that tragic time is the sight of Abraham Lincoln, in the early morning twilight or late at night, walking, sadly and alone, along the winding path under the linden trees which led from the White House to the War Department, bearing the whole responsibility of a nation defending the liberties of the human race.

The senior member of the Electrical Cabinet, by right of service, is Thomas Morrison, of the Department of State. When the war came on he was a telegraph operator in the office of a railroad superintendent in Sandusky, O. He promptly decided to join the army, but was too impatient to wait for the State to get him a gun and, learning that General Scott had called for operators, hastened to Washington, being one of the first to report for duty. Through the whole period of the war he was always where the hardest fighting was going on. He served with McClellan, Dix, Hooker, Franklin and Fitz John Porter; walked among the exploding shells at Yorktown, where his companion, Lathrop, was killed, and accompanied Grant from City Point to Appomattox. For four years he performed most useful military service, but the ethics of statesmanship prohibit him from wearing a Grand Army button. Twenty-six years ago he entered the State Department, and has remained there ever since under the administrations of Fish, Washburn, Evarts, Frelinghuysen, Bayard, Blaine and Foster. No man in the employ of the government knows more concerning its important secret affairs than he. Besides the use of the telegraph in local departmental matters, a large business is done, mainly with Governors of States, Collectors of Customs, representatives of foreign governments residing outside of Washington, and with the numerous officials of this government in foreign countries. In addition to his telegraphic duties, Mr. Morrison acts as assistant to the disbursing officer, a position which requires a practical knowledge of the financial systems and currency of all nations. Hon. J. B. Moore, who was for several years Assistant Secretary of State, was an old operator, and there are several members of the craft in the foreign service of the department. Thomas H. Sherman, Consul at Liverpool, and J. D. Reid, Consul at Dunfermline, are well known as telegraphers. A few years ago Clendenin Eckert, the enterprising son of the Western Union magnate, was sent out as a consul to an important station in one of the South American Republics, and during his administration came near annexing the whole southern continent.

Another war telegrapher who still takes a hand at the key is William M. Ash, of the War Department. He was a soldier in a Pennsylvania regiment of infantry, having been chief operator of the West Chester Railroad prior to his enlistment. In the army he worked at the headquarters of Butler, Terry and Ames. He was in the Weather Bureau for some years and has held his present position since 1888. Mr. Samuel Dickson is also employed in the War Department office. There is a great deal of telegraphic communication between the department and the numerous military posts and stations throughout the country. An Indian War, even when it is fought out in the newspapers, brings a rush of business, and the occasional diversions of anarchistic strikers are a bonanza to the office.

In the Navy Department Mrs. Etta Thompson has for 12 years managed the telegraph business, which, with the building of new vessels, the evolutions of ornamental squadrons and the frequent rumors of international wars, has largely increased.

The Treasury Department operator is Miss Clara F. Marean, a sister of Morell Marean, the Washington manager of the Western Union Telegraph Company. She has been in the office for 18 years, is an expert telegrapher and is thoroughly familiar with governmental matters. The business of the national banks, the collection of customs and internal revenues, the immense business of the sub-treasuries and mints, make a very large amount of telegraphing necessary.

Robert V. LaDow does most of the telegraphing for the Department of Justice and is also an assistant to the superintendent. He is an accomplished stenographer, and is one of the Attorney General's private secretaries. He came from Saratoga and has been in this office for 12 years.

John B. Minick is one of the men who have seen long service and shared the vicissitudes of many administrations. He has been private secretary, stenographer, operator and typewriter to the Postmasters-General for 18 years. He is a native of Lancaster, Pa., but had been in the northern peninsula of Michigan for some years before coming to Washington. The department having to deal with all those citizens of the United States who are postmasters, as well as those who want to be, this office is one of the busiest. During the administration of Mr. Wanamaker he had a private wire between his Washington and Philadelphia offices, and it was in almost constant use.

Miss Emma C. Cooke is the operator in the Interior Department. She has held that office for 14 years, and had enjoyed a long and varied experience in commercial lines before accepting government employment. She is a lady of much literary ability; and an enterprising traveler, having recently returned from a year's journey around the world, by a zig-zag route of her own selection. She is withal a woman of decision and strength of character. Shortly after the last Democratic administration came into power, a chief of one of the bureaus, with an unwarranted assumption of authority, directed Miss Cooke to send some telegrams over the wires which she did not consider admissible under the unwritten rules of honor of the craft, and she refused to obey the order. Thereupon the bureau officer appealed to the chief clerk of the department, who sent a peremptory order that the telegrams must be forwarded. Still she refused, and then war was declared. The chief clerk, in high wrath, went to the secretary, and he summoned the rebellious operator to his office. When she appeared he said, "Miss Cooke, I hear you have refused to obey the orders of Mr. ——; is that so?" "Yes, sir," replied the operator. "And did you also refuse to obey the orders of my chief clerk?" "Yes, sir." "And if I should order you to send those telegrams, would you still refuse?" "Yes, sir." "Well, my dear young woman, I am afraid you have not been reconstructed," said the secretary. "That is true, also, and you will never be able to reconstruct me," was the response. The secretary politely replied, "You may return to your office." And she has been there ever since.

The fourth lady in this group of officials is Miss A. F. English, of the Department of Agriculture, who also has charge of the local telephone exchange in the building. Once every month, at high noon, the Western Union and Postal Companies each send one of their most expert operators over to the department, where they have special wires connected, for the purpose of sending out the crop reports to the Produce Exchange bulletins. There is a sharp rivalry between them. The Weather Bureau is under this department, but it deserves a chapter by itself.

W. J. Slater is the operator at the Government Printing Office. He has served in that capacity for four years after an active career as a commercial and press telegrapher. Public Printer Palmer and his assistant, Mr. Ephriam Cowan, are both operators, always ready to take a hand at the business, if the boys will keep a register wound up for them. They were joint proprietors of one of the numerous Morse telegraph corporations in the northern part of Pennsylvania back in the forties.

The offices in the Capitol are busy places when Congress is in session. The legislators rely upon the telegraph for any necessary information concerning questions which arise in the course of business coming before either house, and the operators are constantly receiving inquiries from them, while the President and the members of the Cabinet must be kept acquainted with the progress of legislation. The operator at the senate is E. E. Morrison, of Maine, and E. J. McCristal manages the office at the House of Representatives. Mac is a Washington man who has had a varied experience of nearly 20 years on commercial, railroad and stock reporting lines. He is an expert stenographer, a rapid press operator and writes the Phillips code like a native.

A New Way of Selling Machinery.

During a recent visit to Philadelphia we happened to witness a new method of selling machinery—at least such machinery as is sold to manufacturing establishments, says a writer in the *American Machinist*.

A wagon was driven up to the door, a young man alighted, and asked the privilege of giving a practical demonstration of the workings of a machine for pattern makers' use. Permission being granted, he, with the help of the driver, unloaded from the wagon and brought in a Fox trimmer, which he proceeded to operate in a skillful manner, showing how readily it, by a single movement of a lever, cut pine wood into any desired shape composed of intersecting straight lines.

He had little trouble in taking an order for a machine and went forth seeking another pattern shop in need of the latest improvements.

Though this system of selling or a similar one has long been used in selling sewing machines and some kinds of farming machinery, it is, we believe, new in such a line as this where the salesman cannot permanently locate, but must go from place to place, hiring his team and assistance on the ground.

Where a machine has to be belted or connected to a steam pipe in order to operate, the plan could manifestly not be so readily applied; but no one who has an opportunity to witness this young man's operations can doubt that it has its advantages.

Perhaps some of our bright electrical salesmen may get a pointer for practical application from this article.

Electric Motors Operating on Single Phase Alternating Current Circuits.

BY ELIAS E. RIES AND GORDON J. SCOTT.

In view of the discussion that has recently taken place in reference to alternating current motors, both on this and the other side of the water, we desire to announce through the columns of the electrical press that, for the last year and a-half, we have given a great deal of attention to the question of power transmission by the use of commercial alternating circuits now in use. The subject has been dealt with on circuits, the frequency of which varied all the way from 200 to 40 cycles per second. Some very useful and interesting facts have come to light, and our experiments have shown that practical alternating current motors of any size can be built and operated at the ordinary frequency of 138 cycles per second, or even at higher frequencies, with a commercial efficiency equal to any direct current motor.

This has been fully demonstrated by experiments made upon a motor in the factory of the Ries Electric Specialty Company, which develops nearly two horse-power at the slow speed of 360 revolutions per minute. The total weight of this motor is just 64 pounds; there are only two pounds of copper on the machine, and it shows a commercial efficiency of 85 per cent. when run upon an ordinary incandescent lighting circuit of 50 volts at a frequency of 138 cycles per second.

The motor referred to is built upon entirely new lines and is radically different from any of the types of alternating motors so far described. The motor operates without the use of condensers, reaction devices, secondary batteries, or similar paraphernalia for changing the lag or phase. We intend to turn out in a short time, in addition to this type, an entirely new and novel single phase motor of high efficiency, having a completely closed magnetic circuit, and as a consequence a very small magnetizing force.

For electric railway work, we have a special form of this motor under way, which will have a variable speed with maximum torque, a feature that has not heretofore been possible either with direct or alternating current motors, although numerous attempts have been made by various well known inventors to produce this desirable result in direct current practice, by the use of motor generators, differential gearing, and other equally complicated devices. The Ries & Scott railway motor of this type will be of 20 horse-power and will weigh when completed about 600 pounds, which is less than one-half of the weight of direct current railway motors, thus combining great starting effort with low consumption of energy and with very light weight.

Owing to patents pending, we cannot enter into fuller details at present, but can state that we will in a few months place upon the market a reliable and self-starting, synchronous or non-synchronous alternating current motor, fully equal, if not superior, to any direct current motor that has been built. This motor will not only solve the difficulty that has thus far been encountered in utilizing single phase alternating currents for operating stationary motors of all powers, but will also render it commercially possible to employ the alternating current for electric railway work on a scale that will render the system, for economy in transmission and regulation, to say nothing of the increased safety and freedom from repairs, far superior to the direct current electric railway practice of to-day.

A St. Louis Lineman Killed.

William A. Godfrey, an arc light trimmer for the Municipal Electric Lighting and Power Company, was shocked to death at St. Louis on March 22, while trimming a lamp on Fourteenth and Mallinckrodt streets. He handled the lamp in such a manner that the current passed through his body, killing him almost instantly. The unfortunate man could not have been killed had he followed General Manager Ayer's instructions, as laid down in the rules recently published in the ELECTRICAL REVIEW.

Electrotherapeutic Quackery in England.

BY GEORGE H. GUY.

The barefaced fraud which is being practiced on the public by the venders of electropathic belts and other so-called electrotherapeutic appliances has attained no mean proportions in this country. We are, however, somewhat better off than our cousins of England, where it is becoming a public scandal. Though the remedy is simple, it is unfortunately not likely to be speedily adopted. The enormous amount of advertising done by the firms dealing in these electrical swindles enables their proprietors to virtually muzzle the lay press, whose adverse criticisms are thus prevented. It is a striking sign of the strength of the London *Times* that that paper has signified its intention of refusing to insert any advertisement of electrical frauds, even under the familiar trade names of electropathic belts, electrical corsets, magnetic brushes, etc. But so far no other daily, with the commendable exception of the new London evening paper, the *Westminster Gazette*, has adopted the same course. To give an idea of the extent to which the English public are being gulled in this direction, it may be here stated that one of the largest proprietors of so-called electrotherapeutic appliances is now making $250,000 a year. He has advertisements in nearly every important paper in England, and it is not unusual for him to fill a whole page of the London *Daily Telegraph* with a recital of the virtues of his wares, and testimonials as to their merits. But there are signs that the reign of this kind of medicine man is nearing its close.

Some time ago T. E. Gatehouse, one of the editors of the London *Electrical Review*, had occasion to examine an electric belt, and at the same time to review a pamphlet from the Electropathic and Zander Institute. The examination of the belt appears to have left an impression on his mind not more satisfactory then that resulting from the perusal of the pamphlet, and Mr. Gatehouse's opinion on both heads was embodied in an article. In this article a certain Dr. Tibbits came in for somewhat pungent criticism, and the result is that the doctor has sued the paper for libel. A verdict for the defendant was promptly returned by the jury, and judgment was given accordingly with costs. Several other cases involving the *bona fides* of the pretension of electrical quacks will shortly be brought before the English courts, and the fact that cognizance is at last taken of the real nature of these pretensions encourages the belief that a salutary change is at hand, and that the public will soon begin to realize the extent to which they are being duped.

In course of the evidence at the trial it transpired that although from two to five milliamperes is recognized as the minimum electrical current used by duly qualified medical men, the ordinary current generated in an electropathic belt will be $\frac{1}{100}$ to $\frac{1}{100}$ of a milliampere. As there would be several paths open for the passage of this current, the surface of the skin, the web of the belt, and the under clothing in contact with the body, the chances of any part of this infinitesimal charge entering the body may easily be guessed.

Lord Kelvin, on being called, testified to his unqualified opinion that the sample belt which had been shown to him, even it worn as directed, was not capable of generating any electricity on the body. On being asked whether he had tested the current in the belt, Lord Kelvin replied: "No, because I know perfectly what the results would be without making any."

This answer led up to a very humorous ncident. Sir Richard Webster, the counsel for the plaintiff, who was examining the witness, asked: "You are not a medical man, Lord Kelvin; I believe it is the only attainment you do not possess?" The witness replied: "I am an M. D. (loud laughter), an honorary M. D. of the University of Heidelberg. I have a license to practice, but I have never exercised it."

A great many people, however, did not take in the humor of the situation, and by way of throwing additional light upon it, a Glasgow correspondent writes to say that in the days when he was a student of natural philosophy at Glasgow, he was one of

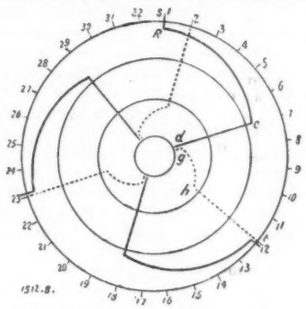

FIG. 2.—METHOD OF WINDING DESROZIERS ARMATURE.

a party that the professor (then Sir William Thomson) was entertaining at supper in his house. The conversation turned to college centennials. "That reminds me," said Sir William, "that I am now an M. D." Then seeing the puzzled expression of the company, he went on: "Yes, I had the honorary degree of doctor of medicine conferred on me recently at Heidelberg." And in confirmation he fetched the diploma and showed it round. "You see," he explained, "they went on the principle of giving their visitors some degree which had not previously been conferred upon them, and this, it seems, was the only one they could find for me; so, gentlemen, if any of you should unfortunately fall ill, you know where to apply."

The New Commissioner of Patents.

Connecticut has again been favored with the chief position in the Patent Office. On March 22, President Cleveland sent to the Senate the nomination of John S. Seymour, of Connecticut, to be Commissioner of Patents.

John S. Seymour is a lawyer by profession, about 45 years of age, and a resident of Norwalk, Conn. Two years ago he was elected State Senator, which was his first public service. In the Legislature he took a prominent part in the controversy growing out of the Gubernatorial election. At the present session he was nominated to be Insurance Commissioner of the State in place of Clarence Deming, whose nomination was rejected.

Commissioner Simonds is a Connecticut man and his predecessor, Hon. C. E. Mitchell, who is now practicing patent law in New York city, is also from the "wooden nutmeg" State.

The Desroziers Continuous Current Dynamo.

We present herewith illustrations, for which we are indebted to London *Engineering*, of a type of dynamo which possesses some features of marked originality, and which has been making rapid strides in the estimation of electrical engineers and the public on the Continent.

The inventor of this machine is M. Edouard Desroziers, ingénieur des mines et expert pres le conseil de la prefecture de la Seine, well known in connection with electric lighting and traction enterprise in France, where the dynamo we illustrate has for some years past been superseding other types in the leading central stations in that country.

A short description will suffice to indicate the striking features of this dynamo machine. Our illustration is of a 100 kilowatt machine, which, it will be seen, has the general appearance of a multipolar dynamo. The special feature is to be found in the armature, which is built up without an iron core, and which, owing to its large diameter, is well adapted to direct driving, now becoming more and more recognized as a desideratum for central station and electric traction purposes among leading electrical engineers in this country. In Fig. 2 the method of winding is shown. The core is

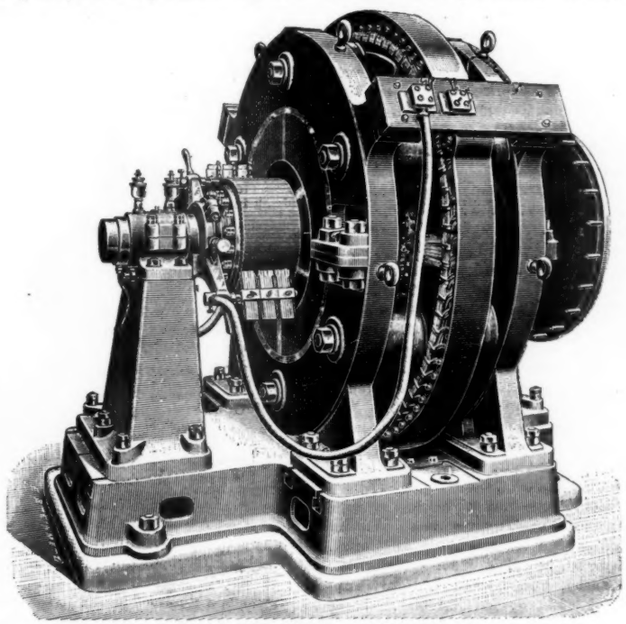

FIG. 1.—THE DESROZIERS DYNAMO.

composed of a round disk of papier-maché, which is divided into a number of segments, 32 in this instance. Starting from a point R, the armature conductor is curved along the circumference until it reaches a segment at C, where it is passed through the perforated papier-maché disk, and carried

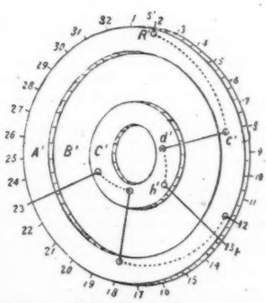

FIG. 3.—METHOD OF VENTILATING DESROZIERS ARMATURE.

radially down the other side to the hub, where, at *d*, it is again threaded through the disk. It is then carried along the hub until a segment at *h* is reached, when it is brought radially up to the circumference again, and so on until the whole armature is wound. The threading of the wire through the perforated and recessed disk holds the conductor rigidly in place, thus disposing of a fruitful source of trouble in dynamo machines as ordinarily constructed. The papier-maché is cut away, as in Fig. 3, finally, thus resulting in thorough ventilation for the whole structure, and so enabling a higher current density than usual to be employed. Stability is given to the whole by "spiders" of German silver keyed on to the shaft and preventing displacement of the disk and its conductors.

More than 42 of these machines have been supplied to the French Navy, and as many more are in course of construction, while the Messageries Maritimes and other steamship lines have adopted them largely. But it is for the purpose of central station and electric traction that these dynamos have made their special mark. Four dynamos, with an output of 640 horse-power, have been installed at the central station in the Rue de Bondy, Paris, and the same number of equal power at the central station of the Nord. Fourteen dynamos, aggregating 2,200 horse-power, have been supplied to the Compagnie Parisienne de l'Air Comprine for the Popp central stations in the same way. Amongst many private installations these of Baron Alphonse Rothschild and Baron Gustave Rothschild at the Château de Ferrières and the Château de la Versine may be enumerated. Many others have been supplied to the government and private firms in Russia and Austria. In all, dynamos aggregating about 12,000 horse-power have been manufactured by the Maison Breguet, who are the makers of the dynamo in France, and it will thus be seen that these machines are adapted for all purposes for which continuous current dynamos may be required.

We ought to mention that the manufacturing rights for Great Britain and the colonies have been acquired by the Brush Electrical Engineering Company, who have already some of the largest sizes of this dynamo under construction.

The Uses of Electricity.

[*From the New York Sun.*]

Electricity is now used in traction, in illumination, in telegraphy, submarine and terrene, in engineering, in medicine and surgery, in agriculture, horticulture and floriculture, in many kinds of mechanism, in manufacturing, in heating, in cooking, and in yet other service. There are thousands of miles of electric railways, a new electric ship is nearly completed at one of our Pacific ports; and we have a promise of a new kind of electrical balloon. This is the electrical age as well as the age of steam. We cannot put any limit to the uses of electricity. There may be other agencies of nature yet undiscovered that will hereafter be serviceable to mankind. It is likely that there will be great times in this merry old world within the next thousand years.

A French View of Electrocution.

Electrocution, says *London Lightning*, has met with a doughty foe in the person of M. d'Arsonval, who declares, in a paper read before the Société de Biologie, that no man is killed outright by an electric shock, whatever the pressure applied might be. Even a rabbit, he says, can be revived by artificial respiration, and why not, therefore, a criminal? He taxes the American government with hurrying over the post-mortem examinations, and characterizes the whole system as *compliquée, barbare, et infidele.*

World's Fair Electric Lights.

We have information from an arc light inspector at the World's Fair grounds to the effect that the principal cause for delay in the electrical construction for arc lights is due to the fact that most of the conduits and manholes at the grounds are filled with ice, which has to be melted out by heat and steam from portable engines, adding greatly to the cost of the installation. The work is at present three weeks behind, and it is probable that the electrical force will soon begin to work at night in order to finish in time for the opening on May 1.

ELECTRIC LIGHT FLASHES.

Franklinville, N. Y., will have electric lights June 1.

The electric light company of Homestead, Pa., has let the contract for engines to the Fisher Company, of Pittsburgh.

One hundred and fifty towns in Pennsylvania are lighted by electricity. In this respect she outranks many of her sister States.

The contract for the new electric plant for the Cloquet Lumber Company, of Duluth, Minn., has been let to the Phœnix Electric Company.

The city of Haverhill, Mass., by the report of the Committee on Manufactures, is given leave to withdraw its petition for leave to manufacture electric light.

The Catskill, N. Y., Illuminating and Power Company has purchased the gas plant of that village for $40,000 and will henceforth furnish gas and electric light.

FIG. 1.—PARTRICK & CARTER COMPANY'S POCKET BUZZER, FULL SIZE.

The Fond du Lac, Wis., Light, Power and Railway Company has selected a site for its power house. The building will be located near the waterworks, and the work of construction will begin next week. The company will have the railway and incandescent plant in operation by May 1.

The Canon City, Colo., Electric Light and Power Company has purchased $5,000 worth of new machinery, and will double the capacity of the plant in every respect in order to meet the growing demands of the city. Manager Slater says the new machinery will be put in place this week.

The Mayor of Watertown, N. Y., has been authorized by resolution of the common council to make a contract with the electric light company to light the city 312 nights a year for five years at the rate of 22½ cents per lamp, and this he has done. This is at the rate of $82.12 per lamp per year.

The streets of Rome are shortly to be lighted throughout by electric lamps supplied with current from dynamos located at the cascade at Tibur, 20 miles from the city,

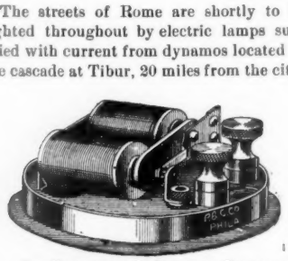

FIG. 2.—PARTRICK & CARTER COMPANY'S POCKET BUZZER, SHELL REMOVED.

in the Alban Hills. This plant is known as the Tivoli long-distance power transmission line, and has been used considerably for experimental purposes before beginning practical work. The probable thoughts of Julius Cæsar or Cato the Censor, could this state of affairs have been foreseen by them, would furnish a good blank for a missing-word contest.

Partrick & Carter Company's Pocket Buzzer.

The Partrick & Carter Company, of Philadelphia, will soon place upon the market a neatly designed pocket buzzer which our illustrations show in full size. It is made entirely of metal and is nickel plated. It gives a loud, clear and not unpleasant sound, and will answer in many places where larger buzzers are used. It is a handy and almost indispensable circuit tester, and every electric bell fitter and wireman should have one. This buzzer is well made and finished, and the price is reasonable.

The Telegraphers' Tournament.

F. J. KIHM WINS THE FAST SENDING PRIZE WITH A RECORD OF 248 WORDS IN FIVE MINUTES—OTHER INTERESTING CONTESTS.

The first telegraphers' tournament which has been held in New York in three years took place at Hardman Hall on Saturday afternoon and evening March 25. A good audience, composed mostly of telegraphers from all parts of the country and including many women, was present. The programme called for contests in six classes, three of which were decided in the afternoon, beginning at two o'clock, and the other three in the evening, beginning at eight o'clock.

Great interest centered in the event for fast sending, as many operators had been practicing for months in the hope of eclipsing B. R. Pollock's record, made at the last tournament, in April, 1890. It will be remembered that Mr. Pollock came up from Hartford, Conn., to enter the last tournament and surprised the old timers and every one else by sending 260 words in five minutes, which still stands as the championship record. The best that could be done in this latest contest was 248 words in five minutes, this feat being accomplished by two men, F. J. Kihm and H. L. Cotten. As Mr. Kihm's style was the better of the two he was awarded the prize.

There were seven judges for the tournament, and, as their duties involved a comparison of the different styles as well as the legibility of the work of competitors, they had not announced all their decisions as we go to press. The judges were: J. H. Emerick, general superintendent Postal Telegraph Company; George H. Dickinson, M. M. Davis, electrician of the Postal Telegraph Company; E. T. Barbarie, A. T. Baer, R. W. Martin, night manager of the United Press, and A. F. Slowey, chief operator of the United Press.

The afternoon contests were as follows:

First Event—Ladies class, open to all; 500 words to be sent; first prize, $50, second prize, $25; receiving, first prize, $25, second prize, $15. Senders—First prize, Mrs. S. E. Sandberg, who sent 500 words in 11 minutes and seven seconds; second prize, Mrs. Louise Wagner, who sent 500 words in 13 minutes and 12 seconds. Receivers—First prize, Mrs. M. L. C. White; second prize, Mrs. S. E. Sandberg.

Second Event—John W. Mackay message class, open to all, for receivers. William Gibson to send for one hour. First prize, gold medal, valued at $150; second prize, gold medal, valued at $100; third prize, nickel-plated caligraph machine. There were 13 competitors in this class.

Third Event, Class A.—Open to all except those who had sent more than 235 words in five minutes in a previous tournament. First prize, $100; second prize, $70; for both senders and receivers. Senders, E. D. Moore, first prize, 242 words in five minutes with two errors; second prize, R. C. Mecredy, 242 words with seven errors.

In the evening these contests were decided:

Fourth Event, Class B.—Open to all who have not sent more than 230 words in five minutes in a previous tournament. First and second prizes, for both senders and receivers, $100 and $75. The contest in this class between O. Hart and R. C. Mecredy was very close.

Fifth Event—W. P. Phillips code class, open to all. First prize, $100, second prize, $75; for senders and receivers. First prize, C. B. Squires, 500 words; time, seven minutes 45 seconds. Second prize, H. McKeldin; time, seven minutes 45 seconds.

Sixth Event—For the championship of the world, open to all. Championship medal and first prize, $100, second prize, $75; for both senders and receivers. Senders—First prize, F. J. Kihm; second prize, H. L. Cotten. Each sent 248 words in five minutes, but Kihm's style was the better.

Resolutions of thanks for his interest in the tournament, and of regret for his present illness, were adopted by the committee in charge of the tournament and were telegraphed to Mr. John W. Mackay, of San Francisco.

In addition to the other handsome prizes offered, The Electrical Review Publishing Company presented prizes of a year's subscription to the ELECTRICAL REVIEW to the six winners of the various events.

Lighting by Phosphorescent Tubes.

We have had the pleasure of introducing the electrical public to a goodly number of advances in science during the last few years, and of explaining with as much clearness as possible the principles, at first seemingly somewhat tangled, upon which the practical results are based. High tension work generally has developed with leaps and bounds, rotary current has stepped into the field, high frequency currents have yielded results seemingly magical, and in all this those most antique pieces of apparatus, the Leyden jar and the Ruhmkorff coil, have played an important, and ever-increasingly important, part. The Geissler tubes, invented in the very early days at Bonn, having long served as the standing wonder of gaping crowds at popular lectures when whizzed around in circles and displayed in letters of phosphorescent light, or discoursed upon by scientists in lecture theatres in fascinatingly interesting considerations of molecular bombardment, these tubes now are receiving the earnest attention of electrical experimenters with the fond and not chimerical hope that in the illumination of the tubes lies the desired secret of practical lighting by glow worm or phosphorescent light—light without heat. 'Tis a consummation devoutly to be wished; and the rich reward that is promised to the inventor of true "glow" lamps is certainly not less than awaits the inventor of "electricity direct from heat."

Amongst the experimenters who have done much in a quiet and persistent way in the domain of extreme high tension and

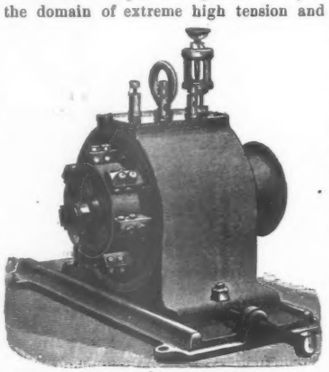

FIG. 1.—PYKE AND HARRIS INDUCTOR DYNAMO.

vacuum-tube research are Messrs. Pyke and Harris, who, together with Sir David Salomons, have carried out the practical utilization of phosphorescent tube lighting to a degree, which, if it cannot be said to solve the long discussed problem, is yet attended with very suggestive and satisfactory results. At various Royal Society and other *conversazioni* displays of phosphorescent tube lighting of some extent have been made, and it is with interest that we have learnt particulars of vacuum-tube lighting for both theatres and private houses that have been carried out on the system thus brought forward. At the works in New Tothill street, Westminster, Mr. Pyke, in conjunction with Sir David Salomons, has been carrying out a number of experiments in this interesting and enticing field of research. Quite a large glass blowing laboratory is kept going for the production of all kinds of vacuum tubes—a very favorite form now adopted being that of a closed coil, or spiral of thin glass tube, between two small bulbs. This coil, when made phosphorescent, gives out a fairly brilliant, cool light, using, it is calculated, about one watt per foot of tube lighted.

The difficulty with these tubes is that when brilliantly phosphoresced they become heated, and there is trouble from melting of the glass after some interval of use. A further difficulty has been the necessity for the use of condensers to properly light the tubes, and condensers are both frail and cumbrous. In any case, the light is never very brilliant—not sufficiently so, for instance, to take the place of ordinary incandescent lamps, though for the lighting of conservatories, where a soft and moonlight effect is desired, the groups of phosphorescent tubes produce an admirable effect, and many houses are now having such "glow" lamps added to the other lighting.

Before alluding to improvements that have recently been made in this class of lighting, it may be interesting to explain the principles upon which the lighting of these tubes has been carried out in experimental form.

An alternating current is, of course, neces-

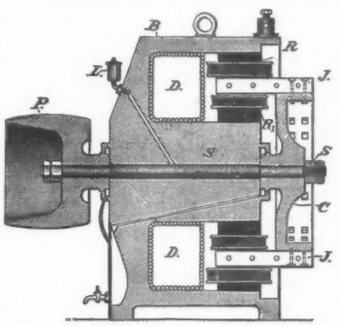

FIG. 2.—LONGITUDINAL SECTION OF PYKE AND HARRIS DYNAMO.

sary, and the inductor machine recently patented by Pyke and Harris is a very convenient form of dynamo to be used for private installations, being small, cheap and compact, though for town houses the alternate currents from the supply mains can be used. This inductor dynamo is herewith illustrated, and is worth the attention of engineers. The wood-cut represents a six-unit machine, which will light 60 sixteen candle-power lamps, though but 20x15x21 inches, and weighing 7 cwt. In the figure, B represents the magnetic mass forming an annular space for the inducing coil, D is the inducing coil, R and R are laminated rings with polar projections wound with armature coils, J J are laminated inductors which alone rotate, and the completion of the magnetic circuit causes the current. It will be noticed that the whole arrangement of the machine is far more solid than any other dynamo as yet in use, and for the same space occupied is the most energetic. The whole machine consists of two castings, some iron stampings and wire coils, and is thus very cheap to construct. Like machines worked on the inductor principle, it has the advantage of no rotating wire; and a further advantage is that, in case of the failure of one or several of the coils, there is a fuse arrangement attached to each connection which melts before the current from the active coils passes into the defective one.

To light the vacuum tubes a tension of 50,000 or 100,000 volts is desired, and this is

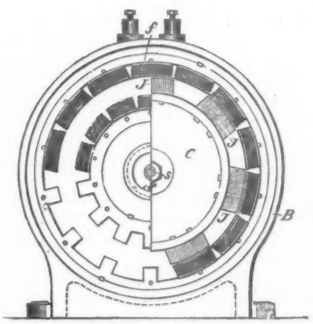

FIG. 3.—TRANSVERSE SECTION, PYKE AND HARRIS DYNAMO.

produced by a specially wound transformer in oil, of the type that Messrs. Pyke and Harris patented and have produced for some years. This transformer is plunged in dehydrated oil, which is kept in circulation by an arrangement of tubes like those in hot-water heaters. These transformers are expensive, and have been lately replaced by a different arrangement.

Having the current at high pressure, the next question is the arrangement most desirable in practice for connecting the tubes,

The tubes are lighted by induction effects, and the peculiar arrangement of connecting the condensers in parallel and the tubes in series is here illustrated for the first time. Mr. Pyke has made careful experiments, and finds that to properly phosphoresce tubes of one inch internal diameter one square foot of tinfoil condenser is required. To light tubes of $\frac{1}{8}$ inch diameter, which have been generally employed, condenser sheets three-quarters inch square are therefore required to give the desired effect.

On one side of a glass plate a number of condenser sheets are arranged of the size desired, and these are all connected in parallel to the high tension circuit, as shown by dotted lines on the figure, the dotted lines representing the under side of the sheet of glass. On the upper side the vacuum tubes are connected from one condenser plate to another, several in series, tubes of the same kind only on any wire, usually to make a total of one foot of tube. The whole of these tubes then light up on turning on the current, it being understood that they are lighted by induction condenser oscillations.

The following are the practical directions for vacuum tube work of this kind:

Class the tubes in average minimum in-

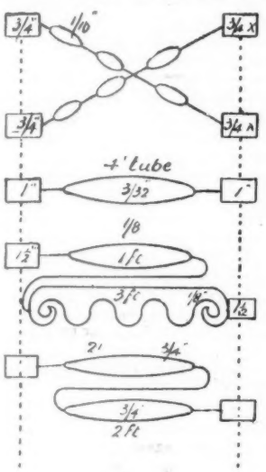

FIG. 4.—DIAGRAM OF CONNECTIONS FOR PHOSPHORESCENT TUBES.

ternal diameter. Arrange that each tube or series of tubes in the various circuits have the same length. Tubes in each class only must be worked in series. Imagine the tubes electrically connected, then arrange the inductors so that one square foot of foil ($\frac{1}{8}$" glass) to each square inch of diameter. Above one inch the current should be graduated more by the surface of the aluminium wire. Any difficulty may be overcome by cutting off one or adding to both inductors.

So far with the methods hitherto used, now to be discarded. The difficulties are apparent—special dynamo, expensive transformer, cumbrous condensers. Experiments have been made to do without the condensers, and to construct a small but powerful transformer which can be used direct. A small closed circuit transformer has been designed by Sir David Salomons and Mr. Pyke, for use in conjunction with the supply companies' alternating current circuits, intended to raise the potential from 100 to 5,000 volts. This is probably the smallest closed circuit transformer yet made, and is very cheap to make, as it is capable of being sold for £1 for ordinary and experimental use. The illustration shows it attached to ordinary 100-volt mains.

The quantity of current which it furnishes at this potential is sufficient to very brilliantly illuminate vacuum tubes. Indeed, so bright are they, that the photograph from which the above illustration is reproduced was taken solely by the light of the tubes suspended from the secondary terminals. The transformer, it will be seen, is provided with an attachment in the form of the usual "B.C." lampholder, the primary winding being connected to the brass contact plates. This is a great convenience, as the connection is made, and the transformer securely held, in any conveniently placed lampholder.

We understand that Sir David Salomons intends proceeding further in the same

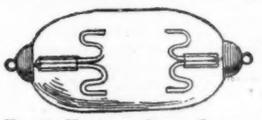

FIG. 6—URANIUM SPRAY LAMP.

direction, and will shortly introduce a combination similar to the above, but with the vacuum tubes permanently fixed thereon, and arranged to form an ornamental illuminating device which can be used in conservatories and other places where beauty is of more importance than a very brilliant illumination.

The curled phosphorescent tube lamp used in these experiments is here illustrated. In practice, the two bulbs are hidden, the glass spiral only being visible, and several of these lamps may be easily arranged to form letters or words. A newer form of uranium tube is also illustrated, in which the electrodes are in the form of a spray. A large number of these tubes can be connected in series, and lighted from the combination transformer.

The transformers are made by winding three primary circuits of No. 22 wire—one at each end and one in the middle—over boxwood bobbins, with the secondary of No. 40 wire in between. The whole is then wound longitudinally over and over with fine iron wire till the central core is filled, making a small and solid bundle, which can be suitably covered with velvet or other material. The vacuum tubes can be mounted thereon. One very convenient point is that, as they are furnished with an ordinary lampholder bayonet point, current at 5,000, or perhaps even 10,000 volts will be within the reach of ordinary experimentalists at a mere nominal cost. The current going into these transformers is only $\frac{1}{2}$ ampere at 100 volts, and the current at the higher voltage is, therefore, infinitesimal—not sufficient, in fact, to give more than a slight shock.

It will be evident that high tension cur-

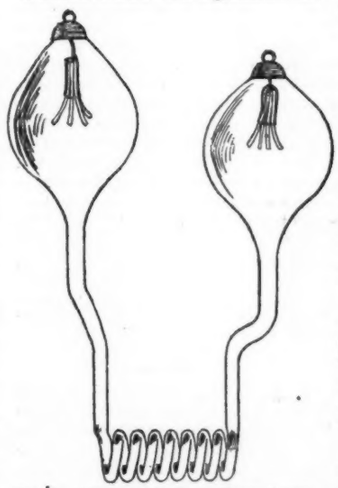

FIG. 5.—PHOSPHORESCENT TUBE LAMP.

rents are now within the reach of all, and we may expect further developments in this fascinating field of phosphorescent tube lighting.—*London Electrical Engineer.*

The General Electric people say that the story published in a Boston paper of their absorbing New England street railways, and that they are soon to acquire control of the West End system of Boston, is without foundation, and it has not been their policy to financier street railways, except in some instances, where small roads using their system required capital to carry them through.

ELECTRIC RAILWAY AND POWER NOTES.

A syndicate is after the electric railways of Easton, Pa.

Senator Cantor expects soon to introduce a new rapid transit bill for New York city.

Massillon, O., capitalists will construct an electric road from that place to Navarre, a distance of five miles.

The passage of the first electric car along the Nine Mile road in Richmond, Va., was hailed with delight last week.

The Scranton, Pa., Traction Company has determined to issue, in the near future, three-cent fares to working people.

Arrangements are in progress for the construction of an electric railroad between Hoosick Falls, N. Y., and Bennington, Vt.

FIG. 7.—PYKE AND SALOMONS' COMBINATION 5,000 VOLT TRANSFORMER.

Bloomington, Ill., is to be connected speedily with the city of Lexington by an electric railway. The town is 20 miles distant on the Chicago & Alton.

Over 80 miles of electric railways will center in North Tonawanda, N. Y., and with their repair shops and car houses will employ 250 men, which means over 1,000 added to the present population.

The new power station of the Hudson Electric Company, in Hoboken, N. J., which was recently completed at a cost of $250,000, was thrown open for inspection last week. The plant is one of the finest in the country.

For some months there has been talk of a trolley line as an outlet for the Kensington district in Buffalo, N. Y. Certain interested parties have succeeded in raising $100,000 for the new line. It is expected that it will be in operation this summer.

There seems to be but little doubt as to the consummation of the plans of the Blackstone Valley Electric Railway Company. It is proposed to run the new road in conjunction with the present system as far south as Northbridge, R. I., taking in all the intervening villages.

The Haverhill and Amesbury, Mass., road intends to run over 30 cars the coming summer between Haverhill and the Sea, making 15 minute time. The Newburyport and Amesbury will run 20 minute trips, the same as they have done for the past two summers.

In five weeks' time electric cars will be running on Third street in Leavenworth, Kan., as the work of transforming the old dummy line into an electric road is being vigorously pushed. The Leavenworth Light and Heating Company will temporarily furnish the power.

The Cayadutta, N. Y., Electric Company have purchased seven open cars, five for Gloversville and Johnstown, capable of seating 50 passengers each, and two to run to Fonda, with seating capacity for 60 each. It has been decided to purchase an additional 300 horse-power generator for the power house.

The Mobile, Ala., Electric Railway Company began operations last week on the extension of their line to Frascati. Work was begun on Cedar street, at its junction with Church street, and operations will be pushed rapidly, in order to complete the line to the Bay Shore by the middle or latter part of April.

Mayor Stuart, of Philadelphia, signed the ordinance giving the Traction Company the right to construct an overhead trolley on Ridge avenue, and the work of erecting the poles will begin as soon as the route can be inspected by Chief Walker, of the Electrical Bureau, and the permit issued by the Director of Public Safety.

The Citizens' Passenger Railway Company, of Harrisburg, Pa., contemplate beginning work on its new motor plant at Steelton in a short time. The plant will be a large, substantial and commodious one. A committee is now in Erie looking after engines for the same. The company has ordered ten new motors, all of which will be put into service as soon as received.

All the exterior work at the new electric power house, in Wheeling, W. Va., on Forty-second street, has been completed, and it is receiving its equipment of machinery. Three batteries of boilers are about ready, and three of the six dynamos are in position. The three big Ball engines have arrived, and will be placed upon their substantial foundations within a few days.

The Westinghouse Electric and Manufacturing Company has just completed the installation of an electric power plant in Pomona, Cal. It is stated the local company manufactured and furnished all the apparatus for the plant, the entire installation being conducted by G. H. Winslow, of Pittsburgh, Pa. The generating plant is located in the San Antonio canyon, 14 miles from Pomona and 28 miles from the city of San Bernardino. Pelton wheels operating under a head of more than 400 feet, and at a pressure of about 200 pounds per square inch, are used to drive the generators, the shafts of which are connected by couplings with the shafts of the wheels. The wheels, and, of course, the generators, operate at 600 revolutions per minute, and each generator delivers alternating current at a pressure of about 1,000 volts to a bank of transformers, by means of which the pressure is increased to 10,000 volts.

The Supply Man Soliloquizeth a la Hamlet.

(With apologies to William S.)

To sell, or not to sell infringing lamps—
That is the question which haunts us day and night.
Whether 'tis better business tact to obey
The warnings and printed things sent out by mail—
Ay, registered mail, forsooth—
Or to take up arms against Sir Edison,
And, by opposing, get into jail? to stop—to sell
No more; and, by stopping, to find we end
The trials and the chance of paying royalty
Our trade seems heir to—'tis a consummation
We truly do not like. Ah, yes—to sell—
To sell! Perchance to gain; ay, there's the rub!
For in this trade of ours what wealth may come
When we have shuffled off this *choking coil*,
Must give us pause; there's the law's delay
That makes uncertainty of so long life;
For who can stand the costs of tedious suits,
The lawyers' fees, the proud inventor's scorn,
The pangs of despised cause, the court's keen eye,
The arrogance of triumph, and the spurns
Acknowledged right of the unworthy takes,
When we ourselves might peaceful quiet gain
By simple acquiescence? We would contracts sign,
And trust to luck to see us through,
But that the dread of something better coming after—
From the undiscovered future which
May hold our weal—puzzles our pockets,
And makes us rather sell the lamps we have,
Than wait for others that we know not of.
These injunctions make cowards of us all,
And thus the native hue of resolution
Is sicklied o'er with the pale cast of fear.
But other lamps of great life and low price,
With this regard, may come our way
And give us chance for action.

VOLTABOUT.

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The *Boston News Bureau* intimates that the recent decline in General Electric was due to heavy sales of stock by the Drexel-Morgan interests, and adds: "New York may have weakened in its faith in General Electric, but New England was never stronger in support of the enterprise." It is predicted that about April 1, or thereabouts, there will be some interesting developments affecting not only the General Company, but several of its competitors.

The attention of our metropolitan editors is invited to "Electrotherapeutic Quackery," published in this issue. They will feel disposed to praise the stand taken by the two London papers in declining advertising from such quacks, but that they will go and do likewise is a matter of grave doubt. To the honor of the technical press be it said that, to our knowledge, none of these advertising frauds have ever been allowed advertising space.

The methods adopted to protect ships from lightning are now so nearly perfect that it is only at long intervals that we hear of a vessel being harmed in any way from that cause. In the recently constructed men-of-war great care has been observed in the placing of the lightning rods affixed to the masts. In some cases branches have been run from the mast along the spars, each tipped with a solid platinum point. Several methods of sheathing are now being experimented with, and it seems that on those vessels containing a considerable amount of explosives, the rod will be run across the deck from the point where the mast enters, over the side and down to the sheathing. There can be little doubt that this will prove the safest plan yet devised. Human lives are far too precious to attempt any experimenting with, and the old motto, "In time of peace prepare for war," is especially applicable in the case of those vessels carrying magazines loaded to the decks with our modern explosives.

We guarantee a hearty welcome to the inventor who shall contrive a magazine arc lamp that will be self-feeding and self-cleaning, and will be cheaper to maintain than the present arc lamp.

Private advices from London state that the electrical business in England is very backward at present. We regret to learn this, but also note that our brilliant contemporary, *Lightning*, finds plenty of news and things to chronicle.

Mr. George C. Maynard, the Washington correspondent of the ELECTRICAL REVIEW, contributes to this issue an interesting story of the government's departmental telegraph service. Mr. Maynard is an old-time military telegrapher, and is thoroughly at home in telling a telegraph story.

It would be well for the lawmakers of the various legislatures of the United States, who about this time of the year devote some consideration to the question of telephone rentals, to remember the result in Indiana a few years ago. There a law was passed cutting down the rentals away below the cost of the service, and the company operating in the State under a license of the American Bell promptly withdrew from the field of general exchange work. At the next session of the legislature the bill was repealed, and telephone legislation has not, we believe, been attempted there since.

THE LAMP SITUATION.

The ominous calm which has prevailed of late among lamp manufacturers whose plants have been shut down by injunctions obtained against them by the General Electric Company is likely to be broken within the next few days in a rather unexpected manner, and those who have considered matters settled, so far as these companies are concerned, will be treated to something of a surprise. There are still some indomitable spirits in the field who do not intend to fold their hands and submit to seeing their business disposed of permanently in such a way without the hardest kind of a fight, and that their brains at least have not been idle will shortly be demonstrated in a very positive manner. All that can be said at present is that "the pot is boiling." Keep your eyes on the fire.

NEW CABLE WORK.

The predominating trait of an Englishman is conservatism. It appears that some Australians are against the idea of a cable under the Pacific ocean touching any other than British territory. The first attempt at a trans-Pacific cable, designed to operate between the United States and Australia, is now under way in a line to connect New Caledonia with New South Wales, and the governments of New South Wales and Queensland have contributed towards its cost. New Caledonia is a French penal settlement, and on this account the Melbourne Chamber of Commerce met recently and "denounced the unpatriotic conduct of these two sister colonies," and further they called on other English colonies to join in supporting the construction of a cable eastward touching only British territory with a land line across British Columbia and Canada.

PIRACY.

The ELECTRICAL REVIEW is the most widely read and quoted electrical journal published, and we are glad that such is the fact. We are also happy to state that in the majority of cases our contemporaries give the ELECTRICAL REVIEW full credit for any matter which they see fit to use from its columns. We have, however, just come upon an especially flagrant case of literary piracy, to which we herewith direct attention. A monthly paper called *The Artisan*, published at Cincinnati, prints without credit, in its issue for February, 1893, two articles, "The Inventor" and "The Place of Electricity in the Modern Office Building," taken bodily from the ELECTRICAL REVIEW for February 25, 1893. This stolen matter forms about a page of the piratical sheet referred to, and, naturally, adds something of value to a paper which is otherwise without interest. We extend to Mr. A. A. Brown, whose name appears as the "editor" of the sheet mentioned, the hearty assurances of our profound contempt.

LETTERS FROM A LABORATORY.—XXXVIII.

BY JULIAN A. MOSES.

A short time ago, a very ingenious but complicated instrument, which seemed to be affected with some incurable complaint, was brought to my laboratory for the purpose of being repaired, if possible. Naturally, the first thing looked for was some broken part. None was found; the instrument appeared clean and free from dust, it having been kept under a glass shade. Upon taking it apart and examining it more closely, it was discovered that the stoppage of the movements was entirely due to the choking produced by the thickening of the oil in two or three bearings. It may be said that a watchmaker would have seen this instantly, but this was not the only difficulty; the instrument would work now and then, but the conditions when this took place had not been carefully noticed. After much questioning, I found that these fits and starts were due to changes in temperature, not as affecting the metallic parts by consequent expansion, but the oil in the bearings had become congealed when the temperature of the room had fallen below a certain point. It appeared that ordinary olive oil had been used as a lubricant and it was this that caused the trouble.

This subject of lubrication is one which has always been passed over as immaterial and of little consequence; but several experiences similar to the foregoing have taught me that it is of some little importance.

It is not easy to obtain a lubricant that adapts itself to all conditions. A good lubricant must possess several qualities, among which may be mentioned the following: The oil must not evaporate as much as three per cent., after being kept at a temperature of about 150° F. for 12 hours. This is a rather severe test, but where a lasting lubricant is desired this test must be resorted to, and may be made by spreading upon a clean sheet of brass a weighed quantity of oil, putting it over a water bath and keeping it at the above temperature for the stated time. If the loss is more than three per cent., it should be discarded for another kind, perhaps more expensive, but which will stand the test. Several successful methods for making "watch oil" are in use, but they are guarded by the manufacturer. One which is well known and perhaps the simplest of all may be performed with great ease. Into one ounce of best olive oil put two ounces of 95 per cent. alcohol, stir well and set aside for one day in a quiet place. At the end of that time gently decant almost the entire contents of the vessel into about a pint of distilled water. Naturally this causes a separation of the oil particles, and by drawing off most of the submerged water and alcohol the layer of purified oil is left behind. This must now be frozen in a mixture of ice and salt, and floating upon the surface will be found, if you are successful, a limpid oil which has resisted the action of the freezing materials. This is an excellent lubricant.

Where lubricants are desired for heavier instruments, there are many that have decided advantages over the ordinary mineral oils. One that has always given satisfaction and is almost universal in its applications is made by mixing, by the aid of moderate heat from a water bath, equal parts of thick vaseline and recently melted india rubber. This forms a lubricant which, it has been said, never alters its original condition. Pastes are very convenient to handle and serve to good purpose in heavier machinery. Plumbago or graphite, a material which is now in such great demand, is another desirable substance, and when mixed with lard or lard oil forms a lubricant which has been well tested and not found wanting. Crude petroleum vaseline, when mixed with equal parts of powdered graphite, makes a medium which adheres to the metal work with a greater force than that between its own particles, and a composition of lard five parts, black lead one part and about one-fifth part of gum camphor makes a lubricant that is adapted to a great many cases. The main, and perhaps only drawback attending the use of these plumbago lubricants is that they soil everything they come in contact with. This is a fault, but it may be remedied by covering all bearings with a piece of some material, such as molded plaster of paris, which has been well varnished, so that there can be no possibility of rubbing off the superfluous lubricant on the clothes or on other places where it is not wanted.

Always keep the receptacles for oils well covered, and, if possible, in air-tight vessels away from extremes of heat and cold.

CORRESPONDENCE.

OUR SEATTLE LETTER.

On Inauguration Day the Sunset Telephone and Telegraph Company celebrated the installation of the one-thousandth 'phone in this city. A year ago it had 811 and at the time of the great fire of 1889 it had only 300. Tacoma has 750, so that she is surely distanced, and, as Portland has only 100 more, Manager A. J. Clark says that he is now about to overtake that city and make this city the second telephone town of the coast.

The Sunset Telephone and Telegraph Company has begun the construction of a telephone line from Spokane, Wash., to Portland, Ore., and will complete it this summer. The line will follow the Columbia river for the greater part of the distance, and the construction party is coming down the river on a flat-boat, on which is a house for eating and sleeping quarters and which carries the material. The line will be about 500 miles long, and will connect at Portland with one running north to Seattle and Tacoma, the former city being 188 miles distant, and with another running south to Salem, Ore., 60 miles. Before summer is over Seattle people will be able to talk to friends in Spokane, nearly 700 miles by wire, though only half that distance as the crow flies. Forty years ago the first settlers in this city were so far from civilization that they had to depend on the coming of a chance schooner in search of spars for their supply of pork and beans, and when one failed to appear, they had to dig clams and pick berries for a living. Several of the men who had this experience are likely to live to use the telephone connecting their own houses with a city which 40 years ago was not dreamed of, its site being then occupied by the Spokane Indians, who were usually on the warpath when food was plentiful.

Seattle Threatens to Rival Buffalo on a somewhat smaller scale in the possession of great water power, for plans are now in the course of execution to transmit the power of Snoqualmie Falls into the city and use it in running all the machinery in the place. Snoqualmie Falls are formed by the descent of the Snoqualmie river over a precipice 268 feet high, into a gorge which broadens out quite rapidly into a fertile valley. Above the falls is the famous Snoqualmie hop ranch, the largest in the world, besides great bodies of the tallest timber in this land of tall timber, while below the river banks are fringed by farms of great productiveness. The falls are reached by the Seattle, Lake Shore and Eastern Railroad, by which they are 55 miles distant, and are one of the favorite pleasure resorts on Puget Sound, but in a straight line they are but 18 miles distant. W. T. Lacy, a wealthy San Francisco capitalist, and Guy C. Phinney, a Seattle millionaire, have joined in the project to utilize the power, and the former has filed notice with the county auditor of his intention. They have also acquired the land on one side of the falls from the heirs of the original locator, and Mr. Phinney has set up a claim to that on the other side, but will have to fight a hard contest with D. H. Gilman for the title. They have started out a party of surveyors to run the line for an electric cable from the falls to Seattle. The cable will be laid underground as nearly in a straight line as possible, only diverging to avoid marshes and any inaccessible mountains which may be encountered, and passing under lakes Sammamish and Washington direct to the eastern limits of the city. The initial plant will generate 5,000 horse-power and, the projectors say, will be in operation within six months. The capacity of the falls, of course, varies according to the volume of water in the river, but at the lowest in midsummer it runs into the hundreds of thousands of horse-power, enough to turn every wheel in Seattle and to supply light and heat when the city shall have reached ten times its present population. The same power can be used to drive the hoisting engines at the Gilman coal mines, to haul logs in the forests and even to light every neighboring farm house along the route of the cable or within reach of short branches. According to the estimates of Messrs. Lacy and Phinney, the economy brought about by the use of this power will be enormous. Its cost to consumers would be only 60 per cent. of the fuel alone used in the power houses of the street railways, leaving out of consideration the interest on the first cost of their separate plants, labor and cost of maintenance.

A deal has just been closed by which D. T. Denny and his two sons, John B. and D. Thomas Denny, who own the stock of the Rainier Power and Railway Company, acquire control of the Seattle Consolidated Street Railway Company. The latter company has grown out of a primitive horse car company until it now owns about 25 miles of electric lines, radiating all through the northern part of the city. Mr. Denny was one of the original incorporators, but, in 1887, L. H. Griffith, of this city, and H. T. Blunck, of Davenport, Ia., bought the controlling interest, and, in 1890, reorganized it and bonded it for $1,200,000. In the last two years Mr. Denny has paralleled the lines of the Consolidated company in the most thickly populated part of its territory with those of the Rainier company, building a system reaching from the heart of the city to Ravenna park, the most northeasterly suburb, eight miles out. As the Consolidated line comes down Second street, the Rainier line down Third street cut into the heart of its business, while it had competition also from the Front street cable and the West street electric roads. The consequence is that all the roads mentioned have been losing money. The Consolidated company has recently been turned over to Mr. Blunck and the other eastern stockholders to manage, as they had been complaining of "Irish dividends." Mr. Denny has now taken it off the hands of both Mr. Blunck and Mr. Griffith by buying their stock and bonds, and will, practically, consolidate the two systems, running cars alternately on the parallel lines, operating the whole from one central power station, building branch feeders and arranging a system of transfers in all directions. Great economy will result from the centralizing of the power supply, as the Rainier power house adjoins the Western mill, also owned by Mr. Denny, from which he will obtain fuel without cost, by using the sawdust and slabs. Mr. Denny has just obtained an extension of the franchise of the Rainier system to 50 years and has arranged with some Boston capitalists to float bonds covering the whole of the two systems, with an aggregate of over 30 miles of line. He is now negotiating with the other two companies whose lines parallel his—the Front street cable and the West street and North End electric—with a view to securing control, and will then have all the lines running north from the business center. As all four lines traverse a section of the city which he located as a donation claim 42 years ago, when he came here as one of the first party of settlers, and a large part of which he still owns, he will be developing his own property by perfecting the street railway system. L. K. H.

Seattle, Wash., March 20.

OUR BOSTON LETTER.

Mr. Orlando W. Hart has been appointed New England agent for the Ford-Washburn Storelectro Company, of Cleveland, O., and has opened an office at electrical headquarters, 620 Atlantic avenue, this city. Mr. Hart states that his company have one of the finest single reduction motors ever put on the market, and intend making a strong bid for electric railway work in this section.

A Movement is on foot to have the Wakefield and Stoneham Street Railroad extended through Lynnfield to Lynn and Peabody. A meeting was held recently to take measures to secure the extension. It is considered entirely probable that the Lynn and Boston Road will eventually be extended from Peabody to the Lynnfield Hotel, and thus give direct connection with Salem and the seashore.

The Selectmen of Needham have granted a franchise to the Needham and Newton Electric Street Railroad Company to lay tracks from Chestnut street to Highland avenue to the Newton line. The company has also a franchise to build from the Needham line, on Needham street, to Winchester street, to Centre street to Walnut street, to the track of the Boston and Albany Railroad. The road will be about 4½ miles in length, and it is expected to be in operation by May 30.

The Competition for the future control of the West End Railway and the street car service of Boston and its immediate vicinity has narrowed down to negotiations now under way between the West End people and the Electric Corporation. The Electric Corporation is a concern newly organized about the first of March, upon a capital of $5,000,000, which was considerably oversubscribed at that time. The directors of the company are as follows: S. Endicott Peabody, president; John Quincy Adams, William T. Rossell, Charles A. Coffin, Geo. P. Gardener, Alfred A. Glasier, George Von L. Meyer and J. R. McKee, of Boston; Francis W. Carpenter, of Providence; Oliver Ames, 2d, of North Easton; John S. Bartlett, of Lynn. The following members of the board were chosen the executive committee: S. Endicott Peabody, C. A. Coffin, Alfred A. Glasier, George Von L. Meyer and John S. Bartlett. A gentlemen who is closely identified with the syndicate now in negotiation for the purchase of the control of the West End road, says: "I am not at liberty at present to tell the whole story of the deal, but it is likely to come out now soon. I can say, however, that negotiations are making satisfactory progress and that little doubt exists as to its early consummation." H. G. T.

Boston, March 25.

OUR CHICAGO LETTER.

George A. Mayo, of the Rockford Electric Company, of Rockford, Ill., was in Chicago this week.

The Railway Equipment Company, of Chicago, report that their Mr. Macartney has secured some very large and important contracts in the East during the past week.

The General Incandescent Arc Light Company, of New York, have established a branch office in Chicago, at 171–173 Adams Street. Mr. L. E. Frorup will be the company's Western representative.

The Pumpelley-Sorley Storage Battery Company, 205 South Canal street, Chicago, have a new storage battery, electro-chemically made, which they propose to put on the market shortly. They have received orders already, which they are trying to fill.

The Central Electric Company, of Chicago, have a fine exhibition of Lundell motors in their store, consisting of a motor driving a dynamo, which in turn generates current to operate lamps, fan motors, and the new Lundell exhaust fan. High efficiency is shown in the combination. M. J. B.

Chicago, March 25.

PERSONAL.

Mr. J. M. Orford, of the Brown Electric Company, Boston, was a New York visitor last week.

Hon. W. D. Sargent, vice-president and general manager of the New York and New Jersey Telephone Company, has gone to Florida, accompanied by his sister, Miss Sadie Sargent.

Mr. John W. Mackay, who was recently shot by a madman in San Francisco, is reported to be improving, although last week he experienced a relapse which it was at first feared might result fatally.

Among the passengers on the "Majestic," which sailed Wednesday of last week, were Mr. H. L. Shippy, of the John A. Roebling's Sons Company, and Mr. Herbert Laws Webb, of the Electric Selector and Signal Company, of New York.

Mr. Robb MacKie, well known to the readers of the ELECTRICAL REVIEW through his contributions to our columns, has resigned from the position of city electrician at Cincinnati, and will accept the position of chief engineer of the "C. & C." Electric Motor Company, of this city.

Mr. J. H. Emerick, general superintendent of the Postal Telegraph Company, Mr. S. H. Austin, American representative of the French Cable Company, and Capt. F. C. Mason, of the Police Bureau, Brooklyn, were recent callers at the REVIEW office. These gentlemen are practical and progressive telegraph workers, well informed in all branches of the business.

Among the passengers on "La Touraine" arriving at New York last Saturday were MM. Lamaille and Perrol, French commissioners to the World's Fair; M. de La Touanne, inspecting engineer of French mails and telegraphs, who will have charge of the French electrical exhibit at the World's Fair, and MM. Weshmakoff and Uthemann, Russian commissioners to the Fair.

Mr. A. M. Young, the successful electric railway builder and proprietor, accompanied by Mrs. Young, deserted the State of Connecticut long enough to spend one and one-half days in New York last week. One of the first to realize the importance of electrical development, Mr. Young has been a constant and able advocate of electric lighting and electric railways, and has reaped the substantial reward so greatly deserved.

Mr. Samuel B. Van Ranst, an electrician with the United States Illuminating Company, of New York, sails for London on Saturday, April 1, by the "Etruria" to take charge of placing the electric equipment in Mr. Augustin Daly's new theatre now being erected in Leicester Square. His principal work will be designing and building the switchboard table. Mr. Van Ranst has made a special study of theatre lighting for many years. He has installed the electric lights in several theatres in this city, including Daly's, Palmer's, the Casino and others. It was only by Mr. Daly's urgent solicitation that he was permitted to go. He returns about July 1.

An Undaunted and Versatile Inventor.

TO THE EDITOR OF ELECTRICAL REVIEW:

I hope you will excuse me when I say that I have invented a most ingenious device and which I believe is a highly valuable contrivance. Before I describe it I will tell you that I have had a great deal of difficulty in obtaining recognition in the separate departments in the patent office devoted to the special elements in my invention, a combination of which I now claim as new and useful improvements in cornshuckers, mouse and rat traps and vibrating or oscillating telegraphs, or electrical indicators.

From the many words of praise I have heard spoken of your valuable Patent Bureau I imagine that this little bit of expensively bought experience will prove interesting to your many patrons and subscribers.

I was anxious to make an invention and I looked around for some yawning necessity waiting to shut up tight. With this end in view, I discovered that there were many improvements to be made in a certain patented cornshucker. I improved it, but it was no go. The patent office threw out the application. A bright idea struck me. I remembered that while the cornshucker was open one night, a hundred or so large rats got into it and carried off half of the contents. So I arranged another device to catch the rats, and combined this improvement with the cornshucker and let it go again. It was no use. The drawings and specifications were returned to me, and I almost gave the thing up in despair.

I had noticed, however, that while the rats were in the corn they continued to eat it, so that nothing was practically gained by catching them, for as many more came the next night, so I resolved upon a bold stroke. I sought the aid of electricity. The first thing I did was to make a ring of little electro-magnets, and, putting them all in series, I arranged them around the box of the cornshucker. I put a battery in the circuit, and at the other end of the line in my house I connected an ordinary vibrating receiver. Now, the unique part of the invention is as follows: On the floor leading to the corn box I spread a lot of liquid glue, and on the bottom of the box I sprinkled some coarse iron filings. As soon as the rats crossed the glue and had their tails thoroughly coated, the iron filings stuck to them; but, while they held merry carnival in their improvised dining room, their tails wagged and produced the same effect as that noticed in the ordinary telephone receiver. Every time a rat wagged his tail I heard it in the receiver in my house and came out with a club and killed him. I have tried the application for a patent for the combination of these three improvements, cornshucker, rat trap and vibrating telegraph indicator, and I am waiting with palpitating heart for the result. If I can get the patent, I feel sure that the telegraph attachment could be applied to the transmission of articulate speech, and would prove a valuable invention.

Respectfully yours,

March 27, 1893. BEN THAYER.

A Traveler's Dinner.

Mr. H. Durant Cheever gave a dinner at the famous Mouquin restaurant, of New York, Monday evening of last week, to several electrical friends. The occasion was to give the host opportunity to say good-bye before his departure for London on the Saturday following, to be absent several weeks on business connected with his official position in the Okonite Company, Limited. There was an enjoyable discussion of a splendidly served dinner, the succulent canvas-back and the rich Chambertin of '65 being about equally appreciated. The discussion took a literary turn and beautiful and entertaining narrative after narrative followed close upon each other. After many "bon voyages" to Mr. Cheever, the guests separated at an hour which each one claimed was, for him, unusually late.

Among the guests were W. H. McKinlock, of Chicago; Frank C. Mason and E. F. Peck, of Brooklyn; W. L. Candee, Geo. T. Manson and E. C. Bradley, of New York.

The Most Economical Age of Incandescent Lamps.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, FEBRUARY 21, 1893, BY CARL HERING.

It is generally supposed that it is an advantage for incandescent lamps to have a long life; the object of this paper is to show that this is a delusion, and that it is not substantiated by facts, but that on the contrary under normal conditions a very much shorter life represents an actual gain in dollars and cents; or in more homely language, if the lamps do not die a natural death, it is more economical to break them at a comparatively early date than it is to keep them in use. The results obtained in the present deductions are so different from what is generally believed that they will doubtless be discredited by many.

At the June meeting of this Institute last year a very able and valuable paper was presented by Professor Thomas and Messrs. Martin and Hassler on "The Life and Efficiency Test of Incandescent Lamps." This paper gives a very complete life-history in the form of data and curves, of representatives of almost all the incandescent lamps made in this country. With this very complete and reliable data as a basis, I have endeavored in the present paper to deduce some figures to show what the best life of the lamp is, everything considered. It is well known that lamps deteriorate and blacken with age, becoming less efficient, and it is, therefore, an important question to know at what age they should be replaced by new ones; it is this point which the present paper is intended to answer.

The method by which the best age is to be deduced is the new and very rational one suggested by Mr. O'Keenan and described in *L'Industrie Electrique*, November 25, 1892, page 510, also in *The Electrical World*, December 24, 1892, page 404. As it is fully described in these articles I will merely state it briefly here. Calculate *for each hour* in the life of a lamp the *total quantity of light* given off by it in candle-power hours *from the time the new lamp was first started;* similarly, calculating *for each hour* in the life of a lamp the *total cost* of this light, that is, the original cost of the lamp added to the cost of all the energy consumed by it *from the time the new lamp was first started* up to that particular hour. Now, it is evident that if for each hour in the life of a lamp we divide this total cost up to that hour by the total quantity of light up to that hour, we will obtain the *average* cost of a candle-power hour of light from the beginning up to this hour. From this final data it can readily be shown at what age this total average cost is the least. If based on actual measurements of the lamp made throughout its life, it is evident that this method will give the most rational and only strictly correct way of determining the real cost of the light actually produced, the only factor which it does not include is the interest on the cost of the lamp and power, which evidently are negligibly small. It includes the effect of the blackening of the bulb and of the lowering of the efficiency. It should be distinctly understood, however, that this method is based on the actual amount of light produced, and on the actual cost of the power; whenever, therefore, either or both of these factors are not of importance, the results deduced here are also of less importance. I desire to emphasize this, as it will doubtless be claimed by many, and with right, that the diminution of the light is of less importance to some consumers than the cost of a new lamp would be.

Having given the candle-power and the power consumption of a lamp throughout its life, any one can by this method deduce the final results as described. In the present case, however, the work, which is somewhat tedious, is greatly simplified by taking the data from Table V in Professor Thomas' paper giving the watts per mean candle-power. This data is given here in Table I for the seven most important of the 13 makes of lamps; the last column giving the average, is the average of all of the 13 lamps of that paper, and not of the seven which we have here taken as the most important. By using the watts per *one* candle-power it is evident that the candle-power curve in the present calculations becomes a straight line, thus reducing the work by more than one half.

TABLE I.

	Watts per mean horizontal candle-power.							
	A.	B.	F.	G.	K.	L.	M.	Av.
Hours.								
0	3.9	4.4	4.1	4.2	3.9	3.8	4.8	4.2
100	4.3	4.8	4.3	4.6	4.3	4.2	4.7	4.5
200	4.6	5.1	4.6	4.9	4.6	4.6	4.7	4.8
300	4.9	5.4	4.9	5.0	4.8	4.9	4.8	5.0
400	5.2	5.6	5.1	5.3	5.0	5.2	4.9	5.3
500	5.5	6.1	5 5	5.5	5.2	5.5	5.1	5.6
600	5.8	6.4	5.8	5.7	5.4	5.8	5.5	5.9
700	6.1	6.7	6.1	6.0	5.6	6.1	5.8	6.3
800	6.4	6.9	6.4	6.3	5.9	6.3	5.9	6.6
900	6.7	7.1	6.6	6.6	6.2	6.4	6.1	6.8
1,000	6.8	7.1	6.8	6.7	6.4	6.2	6.1	6.8
1,100	7.0	7.2	6.7	6.8	6.5	...	...	7.0
1,200	7.1	7.2	6.7	6 7	6.5	...	..	7.0

To illustrate the method, let us deduce the results given for the average lamp in the lamp in the last column. Instead of calculating the results for every hour, which is a very tedious process, it is sufficiently accurate to do so for every hundred hours. From the last column of Table I calculate for each hundred hours the total kilowatt hours consumed per candle up to that age; the result gives the curve *a* Fig. 1. Multiply these values by the cost of a kilowatt hour of energy; 15 cents is the price assumed here; this gives curve *b*. Add to these values the original cost of the lamp *per candle*, that is, the total cost of the lamp divided by the candle-power at the start; this gives curve *c* which is evidently parallel to curve *b*. Draw curve *d* representing the total candle-power hours from the start; in this case this line will evidently be straight; it would be curved if the watts consumed by the whole lamp and if the whole candle-power had been used, instead of the watts per one candle. Curves *c* and *d* are those sought for. These curves are evidently the integrals of those represented by the numbers in the table. The process of integrating is effected most readily by purely arithmetical means, as described above, that is, by simply calculating the totals for each hundred hours, and it can, therefore, be performed by any one without a knowledge of algebraic integration. These curves, however, need not be plotted, they are given here only to illustrate the method. Now divide each ordinate of the cost curve *c* by the corresponding ordinate of the light curve *d*, and the result is the curve *e*, which is the final curve sought for.

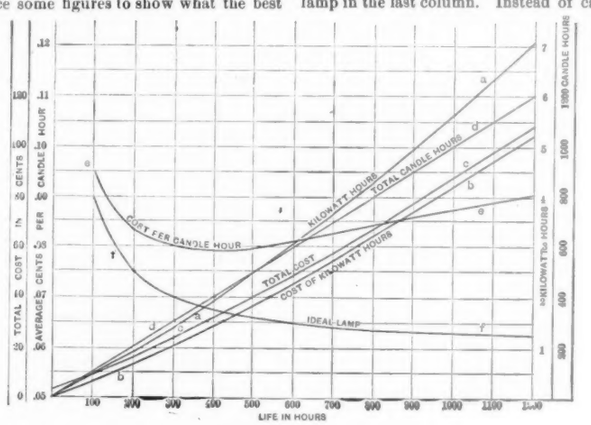

Fig. 1.

This curve *e* gives for each age the cost of a candle-power hour of light, that is, *the average cost for the whole time from the time the lamp was first started up to that particular hour.* This is the curve which gives us the final results. The interesting feature about it is that it has a minimum point at about 400 hours, which means that at the end of 400 hours you are paying the least for a candle-power hour of light, that is to say, your light is then the cheapest during the whole life of the lamp, all things considered. If you continue to use those lamps longer than 400 hours the *average* price for the light will again increase and will continue to do so. Strange as it may seem, therefore, it is more economical to break the lamp at that age rather than to continue running it, even though this means buying a new lamp. This result will naturally be discredited by many, but it is nevertheless true, always remembering that we are concerned with the cost of a candle-power hour of light under normal conditions and over an indefinite period. If the amount of light is of no great importance, but the price of the lamp is, then run them until they die a natural death; the same as if the power cost nothing. If your lamps cost nothing, but your power does, then replace them as often as possible. The effect of different relative costs of lamps and power will be discussed later. The data assumed in this curve is that the average lamp costs 45 cents and the power costs 15 cents per kilowatt hour; the latter figure was obtained from a well known central station manager as a fair average for 110 volt continuous current circuits from central stations or for private installations of about 500 lamps; for installations of less than 500 lamps the cost will be greater, and for more it will be less.

As this curve must always have a minimum point for lamps which deteriorate, there is no question that there is such a minimum value in the cost of the light. Mr. O'Keenan calls this point by the appropriate name "smashing point." To show the results of an ideal lamp, curve *f* has been drawn. This ideal 16 candle-power lamp, costing 48 cents and consuming 4 watts per candle, is supposed not to blacken or to change in any way. It is evident that in this case there will be no minimum point, and the longer such a lamp is run the cheaper the light is, although after a few hundred hours the cost diminishes very slowly, being practically the cost of the power only.

To show what the curve *e* really means in dollars and cents, let us calculate an actual case. If run 1,200 hours the average cost per candle-power-hour is .0903 cents, or a total of 108.4 cents per candle for 1,200 hours. A 16 candle-power lamp, therefore, represents a total cost of $17.344 for power and lamp, assuming for the sake of simplicity that it continues to give 16 candle-power. If stopped at 400 hours the cost of the light is only .0792 cents per candle hour, or a total of 31.7 cents per candle for 400 hours; if renewed three times in the 1,200 hours the cost will be 95.1 cents, or $15.22 for 16 candle-power. This shows that replacing the lamp after every 400 hours represents an actual saving of 13.3 cents per candle during a period of 1,200 hours, or a total of $2.12 saved per 16 candle-power lamp every 1,200 hours. This amount of money represents the cost of almost five lamps at 45 cents, which might be interpreted so as to show some very curious results, namely, if you bought eight lamps originally, used only three of them for 400 hours each and threw the other five away, it will, in the long run, cost you the same as to buy one lamp and run it for 1,200 hours, assuming that you are paying for light actually received. As the cost of the light at 400 hours is over 12 per cent. less than that at 1,200 hours, it is an actual saving of 12 per cent. in dollars and cents if the lamps are replaced every 400 hours.

Another curious result which it will be hard for many to believe, is shown by the fact that the curve *e* cuts the .09 line at 1,200 hours, and also at about 130 hours, which shows that the light costs just as much whether the lamp is broken at 130 hours or run for 1,200 hours. The curves being flat near their minimum points shows that it makes practically no difference (always remembering that we are considering the cost of a candle-power hour of light) whether the lamps are replaced every 300, 400 or 500 hours. It might at first be thought that at 300 hour renewals the lamps will make the cost greater than at 500; but this is not the case, as the curve includes the cost of these new lamps. The explanation of this is that we are considering a constant amount of light, and if run to 500 hours, more lamps must be used to give the same amount of light, owing to their reduced candle-power. Of course, in practice they will be renewed at 500 instead of 300 hours, because the difference in the light would be noticed less than the price paid for the more frequent renewals.

Another interesting and somewhat surprising result which may be deduced from the curves is that an ideal lamp of 16 candle-power, which remains constant, may cost originally as much as $5.75, and will then give precisely as cheap light during 1,200 hours as the existing lamps, and even then it will be cheaper during the next 1,200 hours than the others. An ideal lamp equal to the others at 400 hours instead of 1,200 can cost as much as 75 cents, and will even then be considerably more economical after those 400 hours. This theoretical deduction only goes to show how very great the value in dollars and cents is of a lamp which remains constant.

To show the effect of the price of the lamp and the price of the power, the curves in Figure 2 have been drawn. Curve *e* is, as before, that for the average lamp costing 45 cents, while the power costs 15 cents per kilowatt hour. In curves *g* and *h* the cost of the lamp was taken at 55 and 35 cents, respectively. They show that the minimum point is reached only about 50 hours later when the lamp is 10 cents dearer, and only about 50 hours earlier when it is 10 cents cheaper. The minimum cost is about 2½ per cent. more in the first case, and 2½ per cent. less in the second. The cost of the lamp, therefore, makes comparatively little difference in the best age of the lamp; it affects the cost considerably more at 400 hours than at 1,200 hours, where it is practically insignificant.

If for the same price of the lamp, namely, 45 cents, the cost of the power is taken at 20 and 10 cents, the resulting curves will be *i* and *k*, respectively. This shows that the minimum point is about 100 hours earlier in the first case and 100 hours later in the second. This point is furthermore more decided when the power is more expensive (see curve *i*), showing that for expensive power it is very much more important to replace lamps earlier, while for cheaper power it will make less difference. For cheap power, with cheap lamps, the position of the minimum point, with respect to time, will be varied very little from that of the mean curve *e*; this is also true for expensive lamps with expensive power. The five curves show the following: That even for considerable ranges, the best age remains at between 300 and 500 hours; that the effect of the cost of power is much more important than that of the price of the lamps; that the latter is not of so much importance as is generally believed. All the curves show that, while there is a minimum point, it is not very definitely located as to time; that is, it makes but very little difference if the lamps are replaced at 300, 400 or 500 hours; but after that the difference becomes apparent.

So far we have been considering the average of all the lamps in Professor Thomas' paper. In order to show the relative differences, as well as the absolute values for the different lamps, the curves in Fig. 3 have been drawn for seven of the most important of the 13 lamps; they refer, though not in order, to the Thomson-Houston, Packard, Edison, Beacon, Perkins and Pennsylvania lamps. The letters of reference are the same as those in Professor Thomas' paper. He selected these seven as the most important, and gave me the price of each lamp. These prices were divided in each case by the initial candle-power of each make, as given in that paper, to obtain the cost prices per candle. These candle-powers were as follows: A = 16.0, B = 13.1, F = 14.2, G = 17.1, K = 17.0, L = 13.2, M = 12.5.

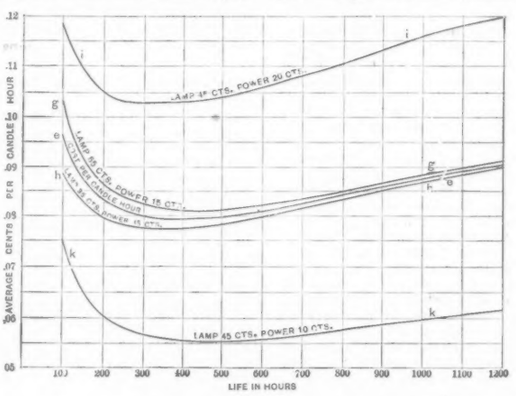
LAMP 45 CTS. POWER 20 CTS.
LAMP 55 CTS. POWER 15 CTS.
LAMP 35 CTS. POWER 15 CTS.
LAMP 45 CTS. POWER 10 CTS.
AVERAGE CENTS PER CANDLE HOUR
LIFE IN HOURS

Fig. 2.

A comparison of these curves with those in Professor Thomas' paper will show the effects of certain features. Such a comparison would be far more interesting and instructive were we allowed to know the names of each one of the lamps.* We can merely say here that *B* and *G* are evidently poor lamps, while *M*, *F* and *A* are the best,

*Just before going to press I have received permission from the makers to state that the lamp marked M is the "Pennsylvania" lamp.

notwithstanding that one of the *M's* died very early, which is equivalent to increasing the price of the other nine lamps. *K* would have been among the best had not one lamp broken at the critical point. The best age of all but *M* are between 300 and 400 hours.

The scale of ordinates in Fig. 3 is much larger than that in Fig. 2, and the minimum point is, therefore, much more marked. The offsets in curve *K* and *L* are due to breakages among the 10 lamps of which these results are the mean. Curve *M* is dotted merely to distinguish it from those which it crosses at a number of places.

In addition to these curves, attention is called to those shown in *L'Industrie Electrique*, Nov. 25, 1892, page 510, or in *The Electrical World*, Dec. 24, 1892, p. 404, deduced by Mr. O'Keenan for foreign lamps, in which the best age is less uniform and somewhat earlier.

Whatever other deductions may be made from this investigation, the most important is that lamps might to advantage be forced much higher than is customary, at the expense of their life. This, though it requires more frequent renewals, will be a gain to the consumer as well as to the central stations; the former will get better and cheaper light, while the latter will be able to increase their output in lights or run the same number of lights at less loss in the mains, or, what is equivalent, run the same number of lamps on considerably smaller mains. How far the lamps may be forced before the other extreme is reached, is a

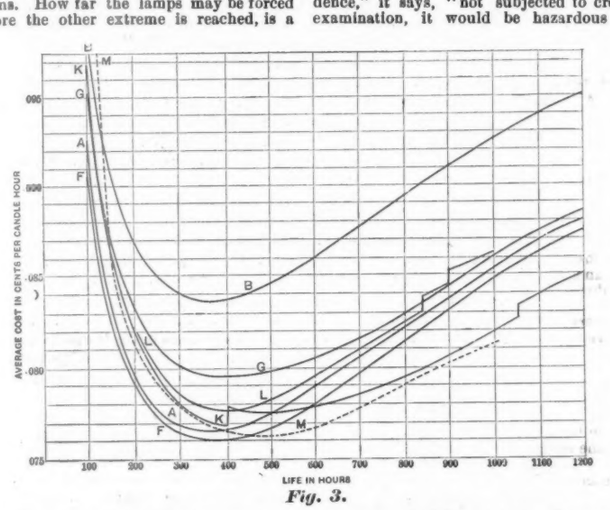

Fig. 3.

question to be determined when we have the data for such new lamps.

In conclusion, I desire to state that while some of the results obtained from the present investigation are somewhat striking, it must not be forgotten that we have been considering the cost of *a candle-power of light*. As it is far more difficult to notice slight differences in the light than it is to notice the bills for lamp renewals, it would not be wise to adhere too strictly to what theory tells us. In practice, therefore, lamps need not be renewed as early as these deductions point out; at the same time, however, the results clearly show that it is absurd to keep lamps running too long, and that the life of our present lamps is more than sufficiently good. Perhaps the best practical rule for renewing lamps is to run them until the diminution in candle-power becomes noticeable, after that point is reached, we may rest assured that it is economical to throw them away. It might be argued that the original data is of too crude a form to admit of making deductions involving small differences. The differences, however, are not slight, but very apparent, and, I presume, much greater than any possible inaccuracies in the original measurements. Furthermore, they show the existence of a uniform law. This paper should be considered more as an investigation of the subject, and not as one claiming to show that present practice is radically wrong. I merely wished to prove conclusively the well-known fact, that it is absurd to run lamps too long. By far the most important conclusion is, that it would be far better to force lamps at the expense of their life than to run them at the present efficiency.

The Point Defiance, Tacoma and Edison Street Railway Company, of Tacoma, Wash., will put an electric storage battery into the "Mount Tacoma," which is to be launched in July. The vessel will be 56 feet long, 10 feet wide and five feet depth of hold. A 75-cell battery will be used, and will be charged from a trolley wire. She is calculated to run 12 hours at a speed of 15 miles an hour, and will carry 150 passengers. Only two similar vessels are in existence, one in San Francisco and the other in New York.

An English View of the Goebel Case.

Our witty contemporary, London *Lightning*, reviews humorously, and at considerable length, the evidence and verdict in the Goebel case. We select these extracts from the article:

Here are the summarized editorial comments of one American paper during the three weeks of suspense:

February 4.—If it should turn out to be only a "fire-cracker," even as fire-crackers go, it is, in the language of Poet Eugene Field, a "corker."

February 11.—Now we shall see what this week will bring forth—whether from out of the mountain shall come forth a mouse or an elephant.

February 18.—Look out for the *** **** next week. You may be the victim of a surprise.

Just now there is a lull. But should that lamp decision favor Goebel, jumping Mercury! won't things be lively!

The result did not come with much surprise after the evidence was taken last week. In fact, one of our contemporaries, the *Electrical Review*, summed up the situation very ingeniously, and scented the issue from afar. It is wonderful how a little experience in the law courts sharpens the olfactory acumen.

"In the face of such conflicting evidence," it says, "not subjected to cross-examination, it would be hazardous to venture on a definite opinion as to where the truth lies." This, of course, was an error. It was not the truth that lied at all—if it was anything, it was Goebel. "But, viewing the matter generally, it seems hardly likely that an artisan who cannot, on his own assertion, even read, should, almost unaided, amass the technical knowledge necessary to make incandescent lamps."

THE THREE "WHICH-ES?"

(*From the American acting edition of Shakespeare.*)

Göbel, Göbel, toil and trouble,
Genius, Joke, or vulgar bubble?
* * * *
Thrice the Edison hath sued.
* * * *
Thrice—and once the Westinghouse.
* * * *
Beacon cries: 'Tis mine, 'tis mine.
* * * *
Hustle, bustle, round about;
Flabbergast with fear and doubt.
Glow-lamps take, that thirty-one
Years and more have service done;
Dust bedrabbled; foul with age;
Offspring of unlettered sage.
Ransack proofs from heaven and earth,
Shred them in for all they're worth.
* * * *
Filament of fenny cane,
Baked and rolled and baked again;
Thread of jute, and tarry strip,
Throw them in—let nothing slip.
Patent holder, "meat-saw" frame,
Soldered in the blow-pipe's flame.
Iron loops, or platinum,
Torricellian vacuum,
Scented bottle from Cologne,
Add a stalk, the thing is done.
Here's a pretty nest of trouble!
Won't the papers boil and bubble?
* * * *
Göbel, Göbel, toil and trouble,
Genius, Joke—*or* vulgar Bubble?

The water power company, of San Angelo, Tex., by which the electric lights are run, is negotiating with the San Angelo water works and the wool scouring mills to furnish them with power.

THE TELAUTOGRAPH.

AN INSTRUMENT FOR LONG DISTANCE BUSINESS TRANSACTIONS.

It has long been recognized that it is the written word that remains. Prof. Elisha Gray, working on this line, has developed an idea which has now grown to a practical machine, and will make it possible to pre-

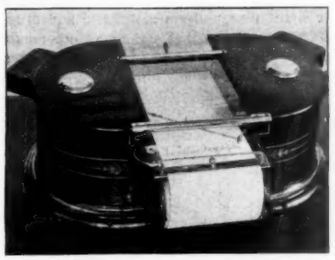

FIG. 1.—THE TELAUTOGRAPH RECEIVER.

serve telegraphic business transactions, and render such communications reliable and lasting.

Several years ago there was exhibited at the American Institute Fair a writing telegraph which was operated by electricity, and was in a measure somewhat similar to the present Telautograph. However, this machine simply enabled the operator to write upon a traveling strip of narrow paper, and the receiver recorded the transmitted message on a similar strip. This was a working machine, but it was not made a practical success. In the Telautograph, which is shown in Figs. 1 and 2, the direction of the writing or drawing may be done at any angle with the direction of the paper, which remains stationary while being written upon. This is obviously a great improvement, for no matter what may be the location or speed (up to a certain rate) of the stylus used by the sender, the movable arm of the receiver follows and records exactly every motion of the pencil.

The transmitter consists essentially of a stylus attached by two fine, strong, silk cords to two revolving drums which are kept in tension by weak springs, and in turn are so arranged as to send exceedingly rapid impulses over the line. A metallic bed-plate is situated immediately under the movable paper, so that as soon as the stylus is touched to the paper electrical contact is made by the pressure upon the plate. Thus it is that the variations in the current are sent to affect the receiver, which is, in the main, constructed similar to the transmitter. Practically, the only difference that exists is, that in place of the pencil stylus are two

FIG. 2.—THE TELAUTOGRAPH TRANSMITTER.

light tubular aluminum arms, joined at one end and controlled at the other by similar silk cords. They constitute the recording device, together with a delicate little glass siphon arrangement which supplies the necessary ink. The slight tension that is exerted upon the writing stylus is not of sufficient consequence to cause any inconvenience in writing. The speed of writing which can be obtained is estimated at about 35 words per minute.

At the exhibition in the rooms of the company, held last week, the practical central station working of the machine was well illustrated, and one feature which is especially worthy of notice, is that the record may be received at any time, for the presence of a person at the receiver is not necessary to obtain a message. There are very few restrictions placed upon easy communication.

The mechanism at present is a sealed volume to the public, as there are certain complications which might ensue were the patent rights left unguarded until everything relative to them is settled.

The office of the Gray Telautograph Company is at 80 Broadway, and the working of the instrument is well worth a visit of inspection.

WORLD'S FAIR NEWS.

At a recent meeting of the executive committee of the International Exhibitors' Association, it was decided to close the Eastern office of the association on April 1, and from that time the principal office will be on the Exposition grounds, Chicago.

A resolution was passed expressing satisfaction for the manner in which the recent applications for space by New York exhibitors have been treated by the officials of the Fair in the final re-adjustment of space. A great number of New York and Eastern exhibitors have finally received the space they desired, and in some instances even more than was asked for.

The Association wish to make known their appreciation of the difficulties with which the management of the Fair has had to encounter in the enormous task in making these allotments, and to tender the thanks of the Association for the efforts which have been recently made to make an equitable distribution of space to New York firms, even though such allotments have been quite late in materializing.

On account of the shortness of the time which now exists for exhibitors to forward and arrange their exhibits, the Association wishes to state that the offices in the Stewart Building will be open until April 1 for any exhibitors who may wish to avail themselves of the services offered by the Association for a careful supervision of their exhibits at the lowest minimum cost by this New York association of manufacturers and merchants.

As there is most likely to be an enormous tonnage of exhibits forwarded at about the same time, April 1, it is especially desired by the officers of the Association that the exhibitors who are arranging with the Association for the care of their exhibits, will now make immediate arrangements for such services as they may require.

Everybody who is at all familiar with the plans of "The MacKaye Spectatorium" is assured of the magnitude of the enterprise, and the following indorsement from Herr Anton Seidl, the great New York orchestra leader, will go far to establish the same certainty as to the artistic merit of the production. After having been shown the model, he expressed himself to a New York newspaper man as follows: "Here will be realized all that Wagner ever dreamed of and more than had been attempted at the Bayreuth Festival. Features, like the rainbow in 'Rheingold,' for instance, which at the German capitals were failures, will here be a marvel of scenic accomplishment. This undertaking will be of more than national importance, as it will undoubtedly lead to the establishment of a grand American Bayreuth Festival."

Chicago Edison Company.

At an adjourned meeting of the Chicago Edison Company, held at its offices in "The Rookery," on March 15, no action was taken to ratify the absorption of the Chicago Arc Light and Power Company, and the meeting was again adjourned to April 18. The deal by which the Chicago Edison Company acquires the Chicago Arc Light and Power Company is, however, closed, and the Arc Light stockholders have received the Edison six per cent. debenture bonds, at the rate of $120 in bonds for $100 in stock. The bonds now sell at 97, and par is predicted by prominent Chicago financiers.

Notwithstanding the Philadelphia Traction Company's opposition, the select council last week approved the independent passenger railway companies' trolley ordinances.

The Ries Improved Universal Base Regulating Socket.

BY ELIAS E. RIES.

The rapid extension of incandescent lighting service that has taken place within recent years, and especially since the advent of the alternating current system of electrical distribution, has not been wholly produced by the electric lamp itself, but is largely traceable to the various auxiliary devices that have from time to time been brought forth for the purpose of rendering the incandescent light more economical, safe and reliable and for better adapting it to the practical requirements of popular every day use. Among these is the well-known Ries regulating socket. Since this little device made its first public appearance, at the Montreal Convention of the National Electric Light Association, in August, 1891, it has not only largely extended the sphere of the incandescent electric lamp, but has in reality opened up a new era in the art of electric lighting, and has placed the latter far in advance of other methods of artificial lighting for general and domestic use.

The Ries regulating socket, as the reader is doubtless aware, is so constructed as to permit the incandescent electric light to be turned up and down in brilliancy, ranging all the way from a faint glow to the full candle power of the lamp, in the same way as has long since been common with gas and oil lamps. This important result is effected without the introduction into the lamp circuit of a "resistance" or any other current-wasting medium, and is accomplished by means of a small and peculiarly constructed "reaction coil" placed within the lamp socket, which, when used on an alternating current circuit, sets up a *variable counter electromotive force* that cuts down the electromotive force supplied to the lamp, and, consequently, also, the current flowing through the lamp, in accordance with the degree of light desired. In addition to the regulation of the light, the Ries regulating socket has the important advantage that it reduces the strain on the lamp filaments, not only in the act of turning on and off the light, which in this socket is performed gradually instead of suddenly, but also in the regular use of the lamps at such times when less than the full candle-power of the light is needed, thereby very materially prolonging the useful life of the lamps with which the regulating socket is used. Thus the incandescent electric lamp, which up to this time has had the serious drawback that the amount of light given by it could not be controlled by the consumer, and that the cost of lamp renewals was disproportionately large in comparison with other lamps, is at last placed upon an equality with its present rival, gas, both as to convenience and economy in use, and is enabled to bring within the control of the central station manager a vast amount of business that has heretofore been entirely beyond his reach.

Like many other pioneer inventions, the Ries regulating socket has since its first introduction made rapid strides toward final perfection. The regulating socket as it is now being manufactured by the Ries Electric Specialty Company, of Baltimore, Md., embraces a number of important improvements that render it far superior in every way to those first placed upon the market.

By referring to Figs. 1 and 2, which illustrate an outside and inside view of the improved socket, respectively, it will be seen that the socket comprises, among other things, the base or lamp holding portion proper, the reaction coil, by means of which the opposing or regulating counter electromotive force is generated, the insulating block or support containing the contacts representing the coil terminals, the operating key, switch arm and binding screw connections for the leading in wires, and the enclosing shell, the latter made in two separate parts.

The mechanical problem of providing an effective, permanent and thoroughly safe and reliable supporting block, that would permit of making the necessary frictional connections between the contact pins and the delicate terminal wires of the reaction coil, was one that presented numerous difficulties. These contact blocks were originally made of wood, which, although of a sufficiently yielding character to permit of making the required connections, had a number of objectionable features aside from those incidental to the use of wood itself, such as those arising from shrinkage of the block and possible loosening and raising of contact pins under atmospheric and other changes. Hard fibre and many other substances of a fibrous character that were then substituted for wood, although in some respects an improvement, failed to give entire satisfaction, and after numerous preliminary experiments with various moulded compositions, and also with porcelain, lava, glass and other insulating materials of a non-yielding or vitreous nature, the writer finally succeeded in devising a porcelain block, together with a method of making the necessary contacts therein, so constructed as to fully and satisfactorily meet every requirement. It is probably safe to say that no other electrical device requires so exact and intricate a porcelain part or demands so high a degree of uniformity as it is necessary to have in this block, in order to enable the manufacture of the sockets to be carried on upon the scale in which it is being done, and in such a way as to have every connection thoroughly reliable and every part come together with the neatness of fit which is so essential to the socket and to rapid, economical work in its production.

FIG. 1.—RIES REGULATING SOCKET.

The reaction coil used in this socket is probably one of the most perfect in existence. It consists of a small finely laminated annular iron core, one and one-quarter inch wide and three-quarters of an inch high, built up of very thin specially treated iron rings, carefully assembled and taped. This core is evenly and skilfully wound by hand with a silk insulated cable composed of seven separately insulated copper wires, varying from each other in size according to the maximum current that each is required to carry, the wires being of different colors to facilitate their proper connection. The ends of this cable, after it is wound upon the core, are then bared and the extremities of the individual wires, each with part of its insulation removed, are threaded through a double series of holes in the porcelain supporting block, in such a manner that, when the copper contact or terminal pins are driven home and clinched at the back of the block, all of the several wires of the cable are connected in series, the winding being divided by the contact pins into seven sections of equal length.

The operating key of the socket, which has its bearing in the porcelain block and projects through an opening in the enclosing shell, is provided with a contact arm that moves over the series of terminal pins on the working face of the block, and, by including a fewer or greater number of the coil sections in the lamp filament circuit, diminishes or increases the counter electromotive force developed by the coil, and thus raises or lowers the light. In other words, when by the movement of the arm over the contact pins, the length of wire in series with the lamp filament is reduced, the self-induction in the wire, due to the presence of the iron core, is diminished and more current is allowed to flow to the lamp, thus increasing its brilliancy. When the arm is moved in a direction to increase the active length of wire in series with the lamp, the self-induction or counter electromotive force set up in the copper wire is increased, thereby permitting a proportionately smaller current to flow to the lamp, causing a diminution in the light.

The operating key moves through an angle of 90 degrees, and its position indicates the extent to which the lamp is turned on. The contact pins are slightly depressed below the hardened glazed face of the porcelain block, so as to form a seat for the end of the contact arm, and thus insure its proper electrical engagement with the pins and prevent accidental displacement. This arrangement also prevents all possibility of short circuiting and consequent heating of a coil section that might otherwise be produced by the bridging of two adjacent terminal pins at the same time, a fault that was by no means uncommon in the case of the wood and fibre sockets before referred to. The entire arrangement and construction of the socket is one of great simplicity and compactness, requiring no more attention or knowledge in operation than the turning off and on of an ordinary gas burner, which in this respect it closely resembles.

It will be noticed that several important advantages are gained by the peculiar construction of the counter electromotive force to which the remarkably high electrical efficiency of the socket as well as the comparative simplicity of its manufacture are due. First, the magnetic circuit is very short, unbroken and of exceedingly low resistance, producing a core of the most perfect type and permitting a high degree of induction with the least possible amount of iron or copper. Second, the seven wires

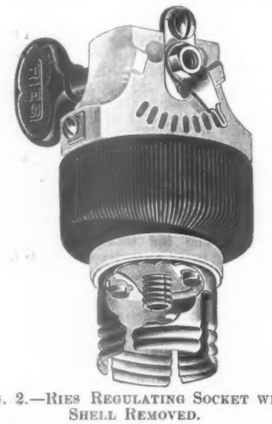

FIG. 2.—RIES REGULATING SOCKET WITH SHELL REMOVED.

comprising the coil are wound upon the core simultaneously, and in such a manner that each wire is distributed evenly around the core at the same uniform distance, so that the entire core is uniformly energized by, and as uniformly reacts upon, each active section of the winding, whether only one or the entire number of wires composing the cable are in circuit. Third, the winding is so proportioned with respect to the maximum current flowing through the same at the different stages of light, and with respect to the iron core, that a very low and practically uniform C^2R loss per unit length is obtained and a maximum induction produced in the iron core throughout nearly the whole range of regulation.

The winding of the socket is so arranged that when the light is turned down to its lowest stage the filament burns at a dull red, emitting just sufficient light to enable one to see the lamp and locate its position upon entering a dark room, and to turn it up to the desired point without having to first strike a match or feel around for it among the electroliers or other fixtures of which it forms part. When the lamp is burning at this stage on an ordinary 50 volt alternating current circuit (the lamp being of standard 16 candle-power), it will consume just $\frac{1}{2}$ of an ampere at an electromotive force of 10 volts, or a total energy of two watts, as against 50 watts when burning at its normal candle-power. In other words, the lamp under these conditions is consuming only $\frac{1}{25}$ of its normal energy, not including certain minor losses, the explanation of which will be reserved for a future occasion. Of course, in practice the consumer would burn his lamps at or near full candle power, and turn them down low at such times only when the full amount of light is not needed, or when, under ordinary circumstances, using the plain key sockets, he would turn out the lamps entirely. The high economy of the Ries regulating socket, however, as has been demonstrated by practical experience, has so reduced the cost of incandescent lighting per lamp to the consumer that the total number of lamps installed and in active use has very largely increased wherever the regulating sockets are used, the revenue to the central station being proportionately augmented.

Heretofore it has been necessary in ordering sockets of any type to specify the particular make of lamps for which they were desired, or to carry in stock a varied assortment of sockets adapted to the leading makes of lamps. This is now obviated by the new universal base, shown in Fig. 2, with which the improved Ries regulating sockets are provided.

It will be observed that the center contact is a hollow slotted stud provided with the standard Thomson-Houston lamp thread upon its outer surface, its interior being of the proper diameter to receive the center pin of the standard Sawyer-Man or Westinghouse base lamps, while its exposed end is arranged to bear against the center disk of the standard Edison lamp base. The slots in the projecting portion of the center stud give it sufficient elasticity to make good electrical contact, and to accommodate itself readily to variations in the diameter of the contact pins or threads that are often found in lamps of different makes. It is also capable of a slight vertical movement to accommodate variations in lamp bases. The stud is of square cross section where it enters the porcelain washer, and has a milled end that fits into a rectangular opening in the stem of the porcelain insulating block that passes through the center of the reaction coil, thus effectively locking the stud and preventing it or the washer from turning.

Surrounding the center stud is a combination spring contact cup, held to the washer by two screws which enter corresponding threaded holes in a brass terminal ring that is located in an annular depression formed in the opposite face of the washer. This combination cup is so designed as to fit lamps with Edison, Westinghouse or Sawyer-Man base, any of which it will readily take. For lamps of the Thomson-Houston pattern, this contact cup is dispensed with, the center stud and contact screws alone being used. The cup is provided with two slotted holes of such shape that it can be readily slipped out or inserted at any time by simply loosening the screws that hold it, and without removing them from the washer.

Owing to the yielding nature of the universal center stud and cup, lamps may be inserted or screwed into the socket without danger of loosening or breaking the globes. Lamps with the Edison screw base may be more quickly inserted and removed than is the case with the existing sockets of the Edison pattern, a simple insertion and slight turn sufficing to fasten, and a mere pull to release, the lamp. The sockets are, however, also furnished with the regulation contact cups for either Edison, Sawyer-Man or Westinghouse bases, or without cups for Thomson-Houston base lamps, for either 50 or 100 volt alternating current circuits. It may be well to state, in order to avoid misconception, that while the socket is designed for Edison or any other type of *lamp*, it is not adapted for such lamps on direct or continuous current circuits, but can only be used as a *regulating* socket on alternating circuits. The total ohmic resistance of the winding on the re-action coil is so low that it does not make an appreciable difference in the brilliancy of the lamp if used on the continuous current circuit. This fact in itself proves that the regulation of the light is not due to resistance, as has been alleged by those unfamiliar with its construction.

ADVANCE INFORMATION.

New Electric Companies Formed and Important Constructions Projected.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week:

New Electric Railways.

DANBURY, CONN.—It is now settled that Danbury is to have the trolley system on its street railways this summer, the company having been granted a franchise by the common council.

NEW ALBANY, IND.—The New Albany Street Railway Company will substitute electricity as the motive power on its street railway, and will build a new electric plant.

EASTON, PA.—The Easton Transit Company has leased the College Hill electric road, owned by the Pennsylvania Motor Company. The line will be rebuilt.

GOSHEN, IND.—The city council has granted a franchise, indefinitely, to the Indiana Electric Power Company, which proposes to construct a street railway in Goshen and run an independent line to Elkhart and Nepanee.

KANSAS CITY, MO.—The Forest Hill Railway Company, capital $150,000, has been incorporated by C. H. Hammett, L. E. Davidson, Geo. Law and Joseph Demy. The company proposes to build an electric railway from Westport to the Waldo Park Race Track.

ST. GEORGE, N. Y.—The State Railroad Commission has approved the application of the Staten Island Belt Line Railway Company for a change of motive power from horses to electricity.

BELLAIRE, O.—The county commissioners have granted the right of way for an electric railway between Bellaire and Bridgeport, a distance of 20 miles. J. K. Jolley and A. R. Layda & Company, the owners, will connect with the Wheeling Electric Railway.

PERU, IND.—An electric street railway has been organized in Peru with the following officers: R. A. Edwards, president; W. S. Mercer, vice-president; R. H. Bouslog, secretary; and C. H. Brownell, treasurer. The company guarantees to build two miles of track within nine months.

KINGSTON, CAN.—Capt. T. J. Craig is pushing the claims of a syndicate for a franchise for the building of an electric street railway. The company will also go into electric lighting.

CHESTNUT HILL, PA.—A charter has been granted to the Chestnut Hill and Morristown Passenger Railway Company. Length, eight miles, between Chestnut Hill and Morristown, Pa. Incorporators, William H. Hemlings, Fletcher Pearson, John T. Dunlap, Albert Tibben and George W. Van Horn.

MOUNT VERNON, O.—The capitalists of this city are at the head of the Mount Vernon Electric Railway and Light Company, incorporated with a capital stock of $400,000, and expect to have their installations completed inside of three months.

CHICAGO, ILL.—The Citizens' North Side Rapid Transit Company; capital stock, $5,000,000. Incorporators, Edward A. Blake, Augustus Newman, J. L. Flannery, A. W. Ring, R. S. Elder, John C. Morker and William Hudson.

DENVER, COLO.—Columbia Consolidated Company, organized with a capital of $1,000,000, intended to construct and operate railroads, telephones and telegraphs in the Republic of Columbia, with the western office in Denver.

JENKINTOWN, PA.—A franchise has been granted by the town to the electric railroad company of that place, and it is expected that work will commence at an early day.

WAYNESBORO, PA.—An electric railroad has been projected to run between this place and Pen Mar.

PASSAIC, N. J.—The Speer Electric Transit Company has been incorporated with a capital of $100,000, for the purpose of building an elevated electric railroad under patents of Alfred Speer.

MEMPHIS, TENN.—The East End Railway Company contemplates adopting electricity for motive power.

OWENSBORO, KY.—The Owensboro City Railway Company has contracted with the Thomson-Houston Company for the equipment of its lines with electricity.

NEENAH, WIS.—An extensive street railway project has been agreed upon for the Fox River Valley. It is the design to build an electric railway from Neenah to Kaukana, a distance of 13 miles, taking in Menasha and Appleton.

HOBOKEN, N. J.—The Hudson and Bergen Traction Company; capital, $5,000,000. Directors, Martin Tierny, of New York city, Theophilus Butts, of Hoboken, and Albert C. Walls, of East Orange.

GENEVA, N. Y.—The Geneva and Waterloo Street Railway Company has been organized with S. M. Hamill, of Cleveland, O., as president; Berry T. Miles, of Cleveland, vice-president; and James F. Hughes, of Cleveland, secretary and treasurer. The capital stock is $200,000.

NORRISTOWN, PA.—The Chestnut Hill and Norristown Passenger Railway Company; capital, $48,000. President, Wm. H. Hulings, of Haddonfield, N. J.

DEVIL'S LAKE, N. DAK.—A State charter has been issued to the Devil's Lake Electric Light and Street and Suburban Railway Company, and the work of organization will be rapidly pushed.

PROVIDENCE, R. I.—A syndicate of Providence, New York and Boston bankers offers for public subscription $5,000,000 Providence and Pawtucket five per cent. street railway bonds. It is understood that the Rhode Island Hospital Trust Company, which joined with the bankers in the offer, has taken $2,000,000 of the bonds upon its own account.

BOSTON, MASS.—The Nantucket Beach Street Railway Company petitions that its name may be changed to the Siasconset Street Railway Company, and that it may operate by any other power than steam.

ALEXANDRIA, IND.—The Alexandria City Council has granted a 50 year franchise for an electric street railway to A. Runyan, A. C. Carver and others, representing an Eastern syndicate.

CHILLICOTHE, O.—James M. Thomas, attorney for certain creditors of the Chillicothe Railway and Light Company, has closed a deal with a New York syndicate whereby they become the owners of the road and electric plant. The syndicate has offered to purchase the plant and franchise of the Juneman Electric Light Company.

BRAINERD, MINN.—The Brainerd Electric Railway Company has filed articles of incorporation, and proposes to build an electric line in Crow Wing County. The capital stock is placed at $75,000, and the incorporators are C. H. Parker, of St. Paul; Ray W. Jones, of Minneapolis, and Fred. S. Parker, of Brainerd.

HOUSTON, TEX.—A company has been formed to build an electric railway to Harrisburg.

WORCESTER, MASS.—The North End Street Railway Company will petition the railroad commissioners for authority to increase the capital stock from $60,000 to $110,000.

PORT HURON, MICH.—A company will probably be formed for the purpose of building an electric line from Port Huron to Marine City.

TACOMA, WASH.—The receiver of the Tacoma and Puyallup Railroad Company has sold the road to Allen C. Mason, who will extend the line and equip it with electricity.

Electric Light and Power.

PEORIA, ILL.—The Spring Valley Electric Light Company; capital stock, $25,000. Incorporators, E. B. Hillman, H. T. Hayes and L. B. Bradley. The Wyoming Electric Light and Power Company; capital stock, $15,000. Incorporators, E. B. Hillman, H. T. Hayes and L. B. Bradley.

HOMESTEAD, PA.—Two of Carnegie's big Homestead mills will be operated shortly by electricity.

FALL RIVER, MASS.—The Fall River Electric Light Company will petition the legislature to amend the charter of the corporation to enable it to supply power as well as light.

GRAND RAPIDS, MICH.—The Wilcox Heat and Light Company has been incorporated with a capital stock of $50,000. The West Michigan Electric Light Company has been incorporated with a capital stock of $60,000.

DOVER, DEL.—A bill before the house incorporates the Peninsula Electric Railway, Light and Power Company. Everett Hickman, George H. Gildersleeve and others are the commissioners named in the bill, with power to run an electric line from Frankford to the Pennsylvania line, and to establish electric lighting plants in the towns along the route.

CHICAGO, ILL.—The Chicago Electric Head Light Company has been incorporated with a capital stock of $200,000 by John T. Van Smith, Arthur Horton and Clarendo R. Eyer.

NIAGARA COUNTY, N. Y.—The Model Town Company has been incorporated with a capital of $1,000,000, with power to increase by a four-fifths vote of the stock to $10,000,000. The company has power to build a town and to operate street railways, electric light and power plants, etc.

LANCASTER, N. H.—The Coos and Grafton Electric Light, Heat and Power Company has been incorporated in the State of New Hampshire with a capital of $50,000.

PAXTON, ILL.—The Paxton Electric Company filed articles increasing their stock from $24,000 to $40,000.

BOSTON, MASS.—The Electric Forging Company has recently sold its State rights to five sub-companies. The Illinois branch is putting in a $100,000 plant at West Pullman, Ill.

HYATTSVILLE, MD.—The people of this town are agitating the question of lighting the place by electricity. The majority seem to be in favor of it.

BOUND BROOK, N. J.—The Bound Brook Electric Light, Heat and Power Company has been incorporated with a capital stock of $5,000.

NEWARK, N. J.—The New Jersey Light and Heat Company has been incorporated with a capital stock of $2,000,000. It is understood that the object is to consolidate the Newark and Citizens' Gas Companies and the Newark Electric Light Company under one management.

BRINKLEY, ARK.—T. H. Jackson, A. A. Diffey and others have obtained a franchise for an electric light plant and will erect same at once.

CATSKILL, N. Y.—The Catskill Illuminating and Power Company has absorbed the Catskill Gas Company.

GLENS FALLS, N. Y.—H. R. Leavens, T. S. Coolidge, M. O. Brown and C. B. and O. S. Potter, of Glens Falls, have a scheme to build a dam across the Hudson river and propose to put in an electric plant and supply the villages of Glens Falls, Sandy Hill, Fort Edward, Fort Ann and Saratoga with electricity for lighting and power.

KITTANNING, PA.—The Kittanning Electric Light and Power Company will increase its capital and enlarge its plant.

BRANDON, VT.—The assignees of George and F. E. Briggs have sold the electric light plant to Mr. Blackwell, of Montpelier. A 150 horse-power engine will be put in the plant.

WHEELING, W. VA.—The Wheeling Electrical Company will build a new electric power house at a cost of $10,000.

MONTREAL, CAN.—The Merchants' Electric and General Service Company has been incorporated with a capital stock of $30,000.

New Telephone Companies.

CHICAGO, ILL.—The Chicago Twin Wire Long Distance Telephone Company has filed articles increasing its capital stock from $2,500,000 to $5,000,000.

PORTLAND, ORE.—The Dalles, Dufur and Antelope Telephone Company has been incorporated with a capital stock of $2,000. G. W. Rowland, A. A. Urquhart and G. R. Rowland incorporators.

CARROLLTON, GA.—The Carrollton and Atlantic Telephone Company has been organized to construct a telephone line from Carrollton to Bella Rica. C. H. Stewart is president, and C. Turner, secretary.

OTTAWA, CAN.—The Railway Committee of the House has passed a bill to incorporate the Automatic Telephone and Electric Company of Canada, with head office in Montreal.

COVINGTON, KY.—The Telephone, Telegraph and Electrical Company; capital, $500,000. Incorporators, E. J. Hickey, James W. Bryan, W. H. Glore and Peter Nodler. The incorporation is the result of the expiration of the patent on various appliances of the Bell Telephone Company.

BROOKLYN, N. Y.—The Brooklyn Telephone Company, by W. Harkins, president, has petitioned for permission to string wires on the various poles and railroad structures, and lay the same in underground subways.

New Manufacturing Companies.

HARTFORD, CONN.—W. N. Woodruff, W. F. Henney and Dr. Geo. S. Miller are the directors of the Green Electric Lamp Company, recently incorporated, with a capital of $100,000, for the purpose of manufacturing a new kind of electric lamp, the invention of Henry Green, of Hartford.

GLENS FALLS, N. Y.—The Electrical Engraving Company, to engrave upon glassware by electricity; capital, $8,000. The directors are C. J. DeLong, A. W. Sherman and G. H. Parks.

NEW YORK CITY.—The Direct Acting Electric Gong Company; capital, $15,000. Directors, Thos. Butler, Edmund A. Footman, Geo. P. West and E. G. Dates, of New York city; Henry D. Oakman and James F. Kelly, of Brooklyn. The company will manufacture and deal in electrical and mechanical apparatus.

CHICAGO, ILL.—The Electric Propeller Company; capital, $200,000. Incorporators, Wm. C. Marshall, Jr., David C. Kling and Louis C. DeProft.

KINDRED INTERESTS

The General Electric Launch Company, 44 Broad street, New York, have sent out a very beautiful catalogue, illustrating, describing and giving the prices of their handsome and efficient electric launches.

Messrs. Royce & Marean, of Washington, D. C., are said to be getting out a catalogue of unique and striking design, in which the humorous fancy, as well as electrical wisdom, of the first named partner will have full vent. As the issue will be limited, the friends of this popular electrical firm who desire a copy should promptly drop a line Washingtonwards.

The new and palatial private car of President McLeod, of the Philadelphia and Reading Railroad, built by the Pullman Company, is equipped with the Johnson switches, manufactured by the Interior Conduit and Insulation Company. The Central Electric Company, of Chicago, Western agents, have a full supply on hand. The car was also wired throughout with Okonite wire.

The Eddy Electric Manufacturing Company, of Windsor, Conn., has removed its New York office from the Electrical Exchange to Room 1,212 Havemeyer Building, corner Cortlandt and Church streets. Mr. Frederick C. Ross, the New York manager of the Eddy Electric Manufacturing Company, is now comfortably installed in one of the handsomest office buildings in New York. The widely known Jewell Belting Company will have an office in the same commodious suite.

The Berlin Iron Bridge Company, of East Berlin, Conn., have received the contract for a new bridge at Norwich, Conn., to span the tracks of the Norwich and Worcester Branch of the New York and New England Railroad, over the Shetucket river. The bridge will consist of one span of 145 feet, with a roadway 24 feet wide in the clear and two sidewalks each five feet wide in the clear. The roadway and sidewalks will both be covered with steel buckle plates and concrete.

The King of Wire Tappers.

SOME POINTS AND ADVICE AS TO A COMPARATIVELY MODERN INDUSTRY.

[*From the Chicago Herald.*]

Speaking of schemes, there is one man in Chicago who caused the Board of Trade more bother than all the other alleged electricians put together. His name is O. M. Stone, a past master in electrical matters, who has spent years in patient study of electricity, and whose fertile brain has evolved so many schemes to circumvent the powers that be that he has been called the king of wire tappers. Mr. Stone is a modest man. He looks like a granger, but any one who tries to sell him a gold brick will surely get worsted in the transaction. Believing that a disquisition on wire tapping would be incomplete without a few words on the subject from this patriarch of the profession, a representative from the *Herald* asked the electrician whether he thought wire tapping could be accomplished.

Mr. Stone could not vouch for it from personal experience, but, from an electrical point of view, he was decidedly of the opinion that it could. He thought, however, that it would require, in this city at least, a knowledge of electricity which not one in a hundred possesses. "In the past three years," observed Mr. Stone, "I suppose that upward of 100 different parties, each representing a coterie of amateur sports, operators and others, have approached me for information on this subject. And it has invariably been in regard to horse racing that they wanted enlightenment. Were I to mention the names of some of these visitors the racing department of a telegraph company would be horrified. Operators, as a rule, do not get princely salaries, nothing near what they should be paid, so that when a proposition is made to them whereby they may clean up a big stake in a day they naturally have an itching to give it a trial. But all these young fellows who have been inclined to test their luck in this way I have seriously advised against making the attempt.

"A large proportion of those who do attempt to tap wires make miserable failures. And it is because of their gross ignorance. I will venture the assertion that 60 per cent. of the operators in all large offices cannot set up and work a common set of telegraphic apparatus, taking the wires from the time they come into the office until they take battery or go out again. Yet with a great part of this class the idea of wire tapping emanates. They think they know all about it, and when some of them come to see me and unfold their schemes I have to smile at their simplicity. They do not recognize the difference between an instrument of four ohms and one of 100 ohms, and upon the subject of galvanometers and Wheatstone bridges they are completely lost."

Mr. Stone was asked how he thought a wire could be successfully tapped.

"There are several ways, all depending upon how it is worked, whether single, duplex or 'quad.' There is one system that would rather worry most any of them, however, and that is the Wheatstone automatic. The 'single' wire is, of course, the simplest way of telegraphing in use, consequently the easiest to interfere with, being only common, old-style instruments. Then there are the duplex systems of different patterns, all requiring sets of a like nature to make them work, such as the 'Stevens,' 'polar,' 'D'Infreville' and other. Next comes the quadruplex, which means four men at each end of a wire, all working at the same time."

"And can the latter be tapped?"

"Oh, yes, under certain circumstances. Suppose you wish to do so. The knowledge necessary would be to know the mileage resistance of that particular wire, the exact mileage where you wish to operate, an accurate amount of resistance to be used on each side of your set, a corresponding amount of battery necessary to have the same strength, and, most essentially, a complete set of quadruplex instruments for the work, together with eight competent men to work it successfully. This, you see, is a very intricate and expensive piece of work."

"There are many failures, are there not?"

"Yes, and they deserve to fail. There is nothing in it. At least that is my opinion. Others may think there is, but I decidedly differ. I might say that I have induced a great many novices to let wire tapping alone, and have no doubt saved them from trouble."

It was suggested to the veteran electrician that a recital of his experiences with the Chicago Board of Trade in getting quotations would be interesting, and he was asked if he could say how he received the markets during the time the quotations were withheld from the bucket shops.

"In the first place," said he, "the Board of Trade had detectives innumerable all hunting for 'taps' supposed to furnish me information. I fooled 'em dreadfully on that point, however. Now, that the fight is all over, I will say that I not only had no wire tapped, but had no necessity for tapping one. I had a better scheme than that."

"But didn't you ever lose your continuous quotations?"

"Never. They had a man who chopped everything in the shape of wires he could find, and occasionally he nipped other wires, but he never succeeded in tracing the source of my information. At one time he cut everything he could lay hands on and then firmly believed he had me in a corner. That made me hot. My office was then in the Traders' building, facing the Board of Trade rooms. The windows of the Exchange floor were all soaped over, the directory foolishly believing I received quotations that way, and they thought they had me sure. Well, that morning, with my wire all cut, as they supposed, as soon as the markets opened I seized a bar of soap and scored every eighth change on my window, giving in addition the buyer and seller sign. It dumbfounded them. A big crowd stood below on the walk watching my quotations, and I never missed a turn. In spite of the cut wires, too, I had my customers supplied within half an hour after the Board opened, and I was furnishing 17 bucket shops at the time."

"I suppose you had some funny experiences during the fight?"

"Well, yes. At one time I had a lot of old dead wires connected up that ran from anywhere to nowhere, similar to what is commonly known as a 'tree' circuit—that is to say, the 'main' wire had 'legs' scattered in all directions, each of which ran in some dark hole, chimney, vacant basement, or the like, and there grounded. I then put a heavy battery on the main circuit and sent a full line of markets over it. There wasn't a single office on the wire, but the mysterious ends made the 'sleuths' believe it was a hot trail, and they would follow lead after lead, cutting each to pieces as soon as discovered. To further bother them, I had my man trail them in turn, and connect the wires again to keep up the illusion. It was three weeks before they found out I had fooled 'em again."

"Now, that the board furnishes its own quotations, I suppose there is not so good a thing in the business for you, is there?"

Mr. Stone pulled in a reflective manner at his long beard. "Well, said he, "I have several other little schemes that serve to keep the pot boiling, and on the whole I cannot complain. My advice, however, to all those who think they have a bonanza in wire tapping is to let it severely alone."

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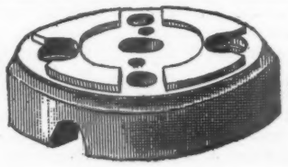

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